

AUGUST 1988

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PCComputing

AMERICA'S COMPUTING MAGAZINE

PREMIERE ISSUE

**IBM or Apple
PS/2 vs. Mac II**

**A Man for All Time
STEPHEN HAWKING**

**Last Writes
IS DOS DEAD?**



**HIGH-VOLTAGE
WORD PROCESSING**

THE 12.5 MHz SYSTEM 200.

A great value in a full-featured AT compatible. An 80286 computer running at 12.5 MHz, this computer is completely MS-DOS and MS OS/2 compatible. The System 200 offers high speed drive options, industry standard compatible BIOS and on-site service. As Executive Computing said of this computer's predecessor, "If faster processing speed and low cost are two key issues affecting your purchase decision, this machine might be the ideal choice for your office."

Standard Features:

- Intel 80286 microprocessor running at 12.5 MHz.
- 640 KB of RAM expandable to 16 MB (4.6 MB on system board).
- 5.25" 1.2 MB or 3.5" 1.44 MB diskette drive.
- Dual diskette and hard disk drive controller.
- Enhanced 101-key keyboard.
- 1 parallel and 2 serial ports.
- 200 watt power supply.
- Real-time clock.
- 6 expansion slots. (4 available with hard disk drive controller and video adaptor installed).
- Socket for 8 MHz 80287 coprocessor.

Options:

- 512 KB RAM upgrade kit.
 - 8 MHz Intel 80287 coprocessor.
- *Lease for as low as \$78/Month.*

System 200	With Monitor & Adapter			
Hard Disk Drive	Mono	VGA Mono	VGA Color	VGA Color Plus
20 MB	\$2,099	\$2,299	\$2,499	\$2,599
40 MB - 40 ms	\$2,299	\$2,499	\$2,699	\$2,799
40 MB - 28 ms	\$2,499	\$2,699	\$2,899	\$2,999
90 MB - 18 ms ESDI	\$3,299	\$3,499	\$3,699	\$3,799
150 MB - 18 ms ESDI	\$3,799	\$3,999	\$4,199	\$4,299
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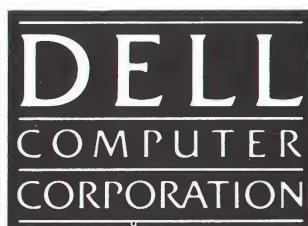
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Standard Features:

- Intel[†] 80386 microprocessor running at 20 MHz.
- 1 MB of 80 ns 32-bit RAM expandable to 16 MB without using an expansion slot.
- Advanced Intel 82385 Memory Controller with 32 KB of high speed static RAM.
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- Dual diskette and hard disk drive controller.
- Enhanced 101-key keyboard.
- 1 parallel and 2 serial ports.
- 200-watt power supply.
- 8 expansion slots.

Options:

- 1 MB RAM upgrade kit.
- 20 MHz Intel 80387 math coprocessor.
- 2 MB or 8 MB memory expansion boards.

**Lease for as low as \$148/Month.*

System 310	With Monitor & Adapter		
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40 MB - 28 ms		\$4,099	\$4,299
90 MB - 18 ms ESDI		\$4,899	\$5,099
150 MB - 18 ms ESDI		\$5,399	\$5,599
322 MB - 18 ms ESDI		\$7,399	\$7,599



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Standard Features:

- 80286 microprocessor running at 20 MHz.
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- Integrated diskette and VGA video controller on system board.
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- Integrated high performance hard disk interface on system board.
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- Real-time clock.
- Three full-sized AT[†] compatible expansion slots.
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Options:

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- Intel 80287 coprocessor.
- 1 MB RAM upgrade kit.

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System 220	With Monitor		
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More
fast talk from
the computer
industry.



"The Dell System 220 runs most PC Labs system benchmark tests at speeds that would make you think you're running a 386."

—PC MAGAZINE

"the System 220 has more going for it than just speed."

—PC WORLD

"...includes a year's on-site support...in the price of the computer. This is the sweetest support deal offered by any computer vendor in the industry."

—ERIC KNORR, PC WORLD

"The hot item from a technical point of view is the System 220. This machine runs a 286 processor at 20 MHz, which is its major claim to fame."

—WILL FASTIE, PC WEEK

"the Dell machine is renewed evidence that the price of 286-based desktop equipment continues to drop rapidly, making such machines very attractive for daily work under MS-DOS even as they hold out the promise of running OS/2 in the future."

—WILL FASTIE, PC WEEK

The reviews are beginning to pour in. And they read like a wish list for every power user looking to exceed the ordinary limitations of a 286 personal computer.

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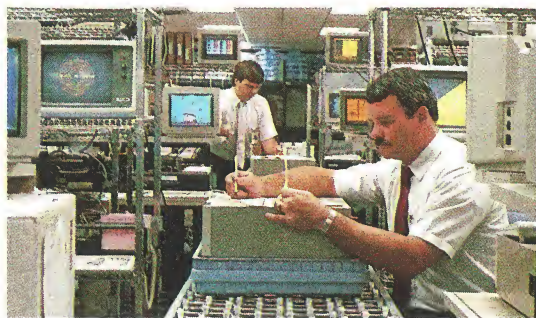
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Statement of Income		(In thousands, except per share amounts)	
Two years ended September 30, 1988		1988	1987
Net sales		1,918,265	1,515,861
Costs and expenses:			
Cost of sales	\$ 1,057,849	\$ 878,571	
Research and development	72,511	71,121	
Marketing and distribution	470,573	392,851	
General and administrative	110,062	81,825	
Operating income before unusual item	1,710,995	1,424,368	
Unusual item-provision for consolidation of operations	207,270	91,493	
Interest and other income, net	(36,981)		
Income before taxes	9,771	17,722	
Provision for income taxes	180,060	109,215	
Net income	58,807	45,115	
Common and common equivalent shares used in the calculations of earnings per share	\$ 121,253	\$ 64,100	
Earnings per common share	61,880	60,872	
	\$ 1.96	\$ 1.05	

See accompanying notes

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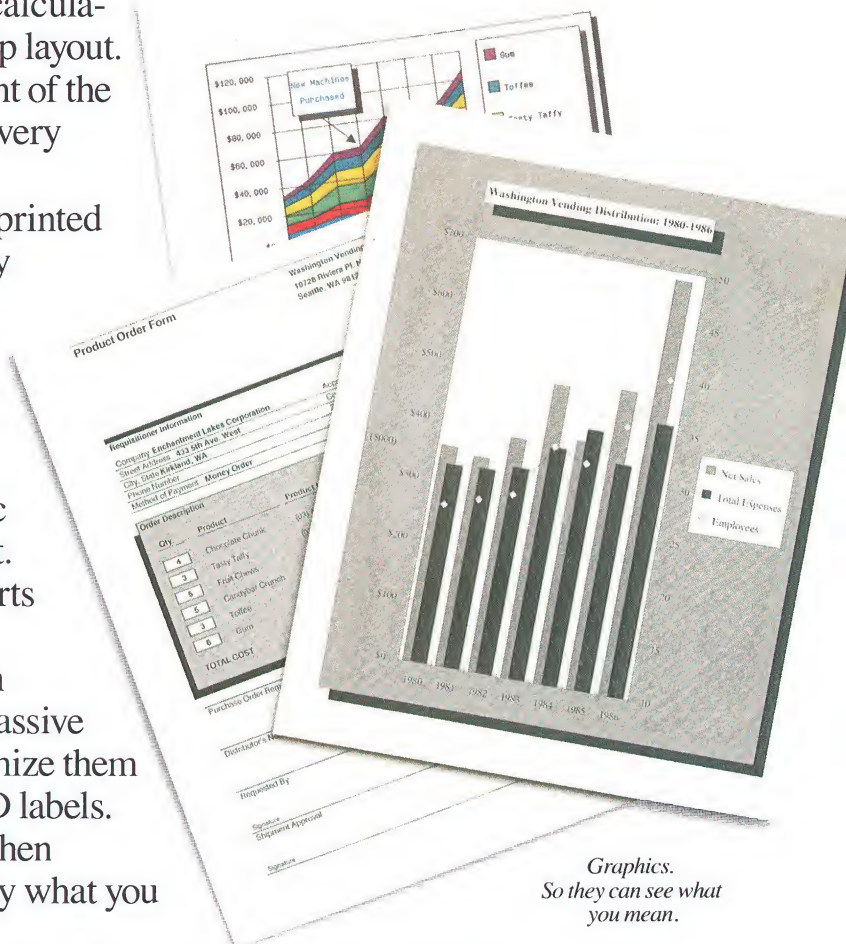
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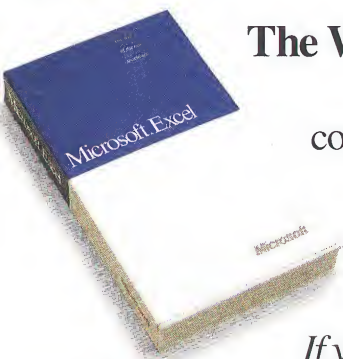
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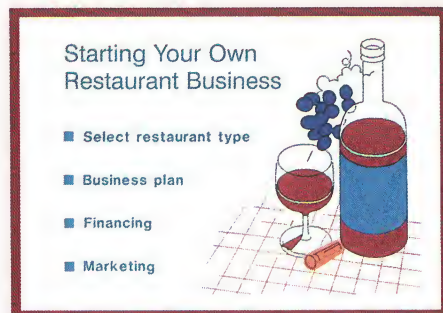
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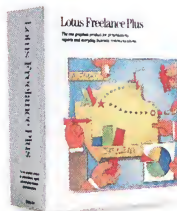
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The person who did this can't draw a straight line.

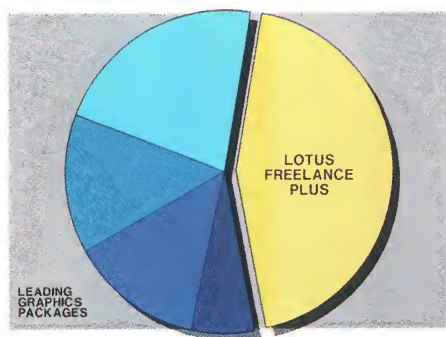


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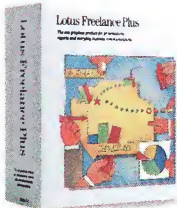
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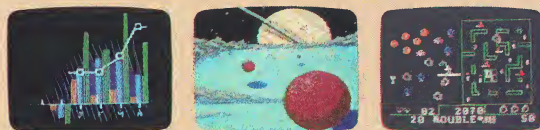
..... STEVE LEVEN, COMMODORE MICROCOMPUTERS

"...Big Blue Disk offers games, educational programs, product reviews, programming utilities, and even commercial programs. We had more fun than an ant at a picnic, and we're going to subscribe!...RATING: ■■■■ Value for Money' (4-stars) FAMILY COMPUTING

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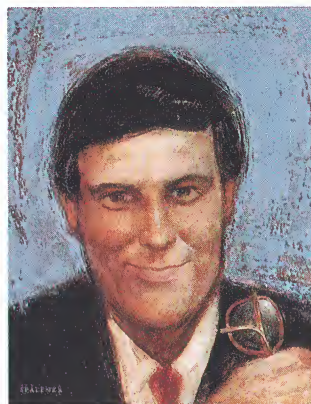
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PERSPECTIVE



Something fascinating has been happening lately among buyers and users of PCs.

Barely eight years ago, most PC buyers were hackers—hobbyists and programmers who could embrace difficult-to-use technology. By the mid-1980s, serious corporate buyers had begun purchasing PCs and software by the thousands. Both hackers and volume buyers will be extraordinarily important in shaping the industry for a long time to come.

But most of us believe the PC is on its way to becoming part of mainstream American life. And it isn't the hobbyist or the corporate buyer who will lead the way.

At the forefront will be a new and growing breed of involved, active, even passionate computer users. This is a group drawn together not by common job titles, organization types, or demographics. We share a high level of knowledge, competence, and interest in personal computing. In short, that's you and that's me.

Over the past few months, I've often been asked, "Why start another computing magazine?"

The answer is as obvious to those of us who are passionate about PCs as it is obscure to those who aren't. Talk to some of the charter subscribers to *PC/Computing* and you'll quickly get a picture of who we are.

- We are rarely interested in technical minutiae, but we are always interested in results and in gaining mastery of the

technology that is part of our lives.

- We are vitally interested in how PCs can contribute to our professional and personal growth, give us more free time, inform us, and educate us and our families.

- Many of us are in positions of responsibility—or are reaching for those positions.

- Individually and collectively, we use PCs in ways that are changing how we organize, how we compete, how we cooperate, how we market established products and create new ones, how we communicate and share, learn and enjoy.

- We are, above all, risk-takers and adventurers.

We need a publication that speaks to the breadth and richness of our PC interests. A magazine as interested in the world of ideas as it is in the world of things. Knowledgeable about both. Brash, funny, direct, authoritative; full of energy, insight, and intelligence.

We need a magazine we can truly call "America's computing magazine." We need a magazine that captures the full power of PCs in our professional and personal lives.

That's why Ziff-Davis created *PC/Computing*. It is also why someone as enthusiastic and involved with PCs as I am would give up a senior position at Lotus to lead it.

MICHAEL KOLOWICH
Publisher

PORTRAIT BY GREG SPALENKA

Get your work done before 1991.

The future of personal computing is clear. More powerful PCs. Easier to use PCs. With graphics and character-based programs working side by side. Talking to each other. Multitasking. Windowing. Menuing. Mousing. Getting your work done easier and faster.

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DESQview™ is the operating environment that gives DOS the capabilities of OS/2™. And it lets you, with your trusty 8088, 8086, 80286, or 80386 PC, leap to the productivity of the next generation. For not much money. And without throwing out your favorite software.

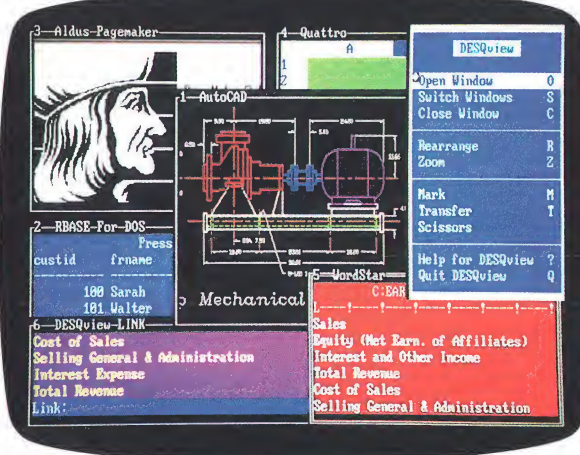
Add DESQview to your PC and it quickly finds your programs and lists them on menus. So you can just point to the program, using keyboard or mouse, to start it up. DESQview knows where that program lives. And what command loads it.

For those who have trouble remembering DOS commands, it adds menus to DOS. It even lets you sort your files and mark specific files to be copied, backed-up, or deleted—all without having to leave the program you're in.

Best of all, DESQview accomplishes all this with a substantial speed advantage over any alternative environment.

Multitask beyond 640K.

When you want to use several programs together, you don't have to leave your current program. Just open the next program. View your programs in windows or



For programmers, DESQview's API, with its strengths in inter-task communications and multitasking, brings a quick and easy way to adapt to the future. With the API's mailboxes and shared programs, programmers are able to design programs running on DOS with capabilities like those of OS/2.

full screen. Open more programs than you have memory for. And multitask them. In 640K. Or if you own a special EMS 4.0 or EEMS memory board, or a 386 PC, DESQview lets you break through the DOS 640K barrier for multitasking. If you have other non-EMS memory expansion products like AST's Advantage or the IBM® Memory Expansion Option, we have a solution for you, too. The ALL CHARGE-CARD™ 'unifies' all your memory to provide up to 16 megabytes of continuous workspace. DESQview lets you use this memory to enhance your productivity. You can start 1-2-3 calculating and tell Paradox to print mailing

labels while you're writing a report in Word Perfect, or laying out a newsletter in Ventura Publisher, or designing a building in AutoCAD.

DESQview even lets you transfer text, numbers, and fields of information between programs.

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For 80836 PC users, DESQview becomes a 386 control program when used in conjunction with Quarterdeck's Expanded Memory Manager (QEMM)-386—giving faster multitasking as well as virtual windowing support.

And when you use DESQview on an IBM PS/2™ Model 50 or 60 with QEMM-50/60 and the IBM Memory Expansion Option, DESQview gives you multitasking beyond 640K.

Experts are voting for DESQview. And over a million users, too.

If all of this sounds like promises you've been hearing for future systems, then you can understand why over a million users have chosen DESQview. And why PC Magazine gave DESQview its Editor's Choice Award for "The Best Alternative to OS/2," why readers of InfoWorld twice voted DESQview "Product of the Year" why, by popular vote at

Comdex Fall for two years in a row, DESQview was voted "Best PC Environment" in PC Tech Journal's Systems Builder Contest.

DESQview lets you have it all now.

DESQVIEW SYSTEM REQUIREMENTS:

IBM Personal Computer and 100% compatibles (with 8086, 8088, 80286, or 80386 processors) with monochrome or color display; IBM Personal System/2® Memory: 640K recommended; for DESQview itself 0-145K • Expanded Memory (Optional): expanded memory boards compatible with the Intel AboveBoard; enhanced expanded memory boards compatible with the AST RAMpage; EMS 4.0 expanded memory boards • Disk: two diskette drives or one diskette drive and a hard disk • Graphics Card (Optional): Hercules, IBM Color/Graphics (CGA), IBM Enhanced Graphics (EGA), IBM Personal System/2 Advanced Graphics (VGA) • Mouse (Optional): Mouse Systems, Microsoft and compatibles • Modem for Auto-Dialer (Optional): Hayes or compatible • Operating System: PC-DOS 2.0-3.3; MS-DOS 2.0-3.2 • Software: Most PC-DOS and MS-DOS application programs; programs specific to Microsoft Windows 1.03-2.03, GEM 1.1-3.0, IBM TopView 1.1 • Media: DESQview 2.0 is available on either 5-1/4" or 3-1/2" floppy diskette.

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Do tell me about "startling new technologies," provide serious "no-punches-pulled" reviews, include useful utilities to overcome some of the shortcomings of DOS and OS/2. Do raise the technological and social consciousness of computer users. Do your best to bring out the best in those you touch.

There it is. That's the contest. If it's not good, it's gone.

H. W. Neff
Castro Valley, California

You Said It

As the owner of a new business venture, I look forward to receiving *PC/Computing*. Since my business is small, with limited resources and personnel, the information and tips in *PC/Computing* promise to be invaluable.

Francis E. Willmes
Grand Rapids, Michigan

Beginners' Blues

A common problem with computer magazines is that the first few issues deal superbly with explaining the workings of hardware and software to beginners, but after a few issues, the editors seem to feel bored with beginners' topics or assume that the readers now know the ropes. They forget that

there are beginners entering the world of computers all the time.

I hope your new magazine will reverse this trend and remember the beginners.

Paul R. Ahrens
Middlebury, Connecticut

Analytic Appliances

With the increasing use of computer chips in everything from automobiles to refrigerators, will there come a time when we use the family computer to analyze problems and evaluate the performance of our purchases?

Jonathan P. Jones
Largo, Maryland

Probably. But meanwhile we encourage our readers to save their warranties.—Ed.

Natural Selection

Congratulations on a publication that promises to be a real boon to computer users. As computing has evolved, many of the publications have not. It's good to see that someone has recognized that problem and is moving to solve it.

I am especially looking forward to thorough product reviews and advice. With an editorial philosophy like yours, I know that *PC/Computing* will soon move to the front of the pack.

Theresa Mueller
Columbia, Missouri

No Pundits Allowed

Congratulations and best of luck with your new publication. May I suggest that you concentrate on the practical aspects of buying, using, and maintaining PCs as they exist and are marketed *now*—not as the PR flacks and self-styled pundits proclaim they will be in

another week, month, year, decade...

Enough sources provide opinion and rumor about what's just around the corner. You will be doing everyone a favor if you keep to the basics: how I can use what I have to make myself (my business, my kids, my group) more productive.

Jeff Armstrong
Arlington, Virginia

Old Dogs, New Tricks

Day after day, I meet people of my generation who wonder about computers but think this magical world is out of their reach. Not so! At age 59, I purchased my first computer. With no training except from manuals, I entered a new era. And now, my toy gives me hours of fun and entertainment.

I hope your magazine succeeds in reassuring people who are intimidated by their lack of understanding that this is not a science too difficult for "old dogs" to learn.

Catherine Dawkins
Jacksonville, Florida

Beam Me Up, Scottie

I hope your new magazine will provide the kind of support I want and need. I have tried and abandoned several publications that promised to reveal the secrets of the trade to those of us who are still terrorized by "bad command" messages.

I've advanced beyond rudimentary computing, but still I look forward to the many wondrous things you can put in your magazine that will transform this hacker into a space cadet.

Richard J. Cassutt
Ford Benton, Montana

Fasten your seatbelt.—Ed.

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Less: Sales Discounts	268	273	279	284	290	296
Net Sales	18,108	18,470	18,495	19,108	19,490	19,886
Cost of Goods Sold:						
Beginning Inventory	18,700	19,874	19,455	19,845	20,241	20,646
Purchases	324	330	681	452	461	470
Transportation	268	273	279	284	290	296
Less: Purchase Returns	324	330	681	452	461	470
Goods Available for Sale	18,108	18,470	18,495	19,108	19,490	19,886
Less: Ending Inventory	18,108	18,470	18,495	19,108	19,490	19,886
Cost of Goods	9,921	10,119	9,978	10,420	10,626	10,841
Gross Margin	9,921	10,119	9,978	10,420	10,626	10,841
Selling Expenses:						
Sales Force Expense	1,250	1,285	1,311	1,327	1,364	1,391
Advertising Expense	240	265	271	276	281	287
Promotion Expense	180	184	187	191	195	199
Building Expense	140	143	146	149	152	155
Other Selling Expenses	60	62	63	65	67	68
Total Selling Exp	2,540	2,591	2,643	2,695	2,749	2,804
Development Expenses:						
Engineering Salaries	120	122	125	127	130	132
Lab Supplies	80	82	83	85	87	88
Contracted Engineering	60	61	62	64	65	66
Building Expense	22	22	23	23	24	24
Other Development Expenses	31	32	32	33	34	34
Total Development Exp	213	219	223	233	239	244
Administrative Expenses:						
Salaries and Benefits	860	877	895	913	931	950
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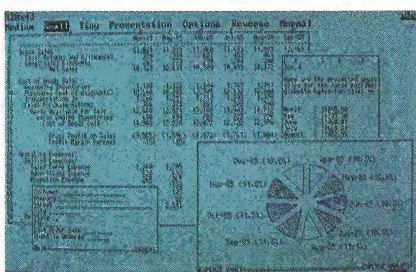
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Small	106x33	128x43	106x48	120x43	128x50
Very Small	128x25	150x51	128x53	144x43	N/A
Tiny	128x33	160x58	160x60	180x58	160x66
Presentation	40x25	40x25	40x34	45x25	40x28

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quality available.

You've noticed
we put together our
Yes, thanks to Q&A
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we write letters like
this so we can spend more
time in person.

Thanks again,
fine people at

Sincerely,

Roland Sanders
Roland Sanders
District Manager

P.S.

Armstrong
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Nouaux
& Greenwood

Ms. Alice Lansing
Tough-Guy Manufacturing
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Keokuk, AK 99504

Dear Alice:

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think you'll find the
quality available.

You've noticed
we put together our
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(ha,ha). But seriously,
we write letters like
this so we can spend more
time in person.

Thanks again,
fine people at

Sincerely,

Roland Sanders
Roland Sanders
District Manager

P.S.

Armstrong
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Nouaux
& Greenwood

Mr. Randy Tisdale
Associated Distributors
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San Pablo, CA 95432

Dear Randy:

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You've noticed, I'm sure, that your service has improved since
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NORA

G E O R G A S

Welcome to the premiere issue of *PC/Computing*, a different kind of computer magazine for a different kind of computer user.

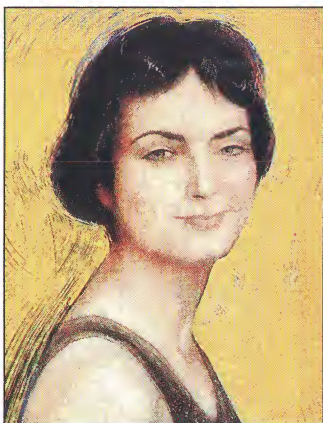
We who created *PC/Computing* are writers, editors, and designers with a passion for technology and a consuming interest in the ways PCs are changing our lives. That passion gives us the freedom to bring you the types of stories that fill this first issue. Stories that inform and entertain with a mix of hard-nosed reporting, nuts-and-bolts details, and writing that's alive with wit and whimsy.

Our philosophy of energetic, stylish reporting guides the magazine. Our columnists have their fingers on the pulse of the industry, and they'll be delivering insightful and sometimes controversial opinions issue after issue. Each month our New! section will bring you up to date on the most important developments in hardware, software, and research, flagging the trends you need to know about. This month we feature a report on PS/2 clones, plus the latest from IBM and Compaq, advances in CD-ROM, and a look at great new software coming down the road.

There's news from around the world too. This month we kick off our Eurotech department with a report from Munich that chronicles the rise of Silicon Bavaria as a force in the European computer market. Next month, we'll add Asiatech—a regular report from Korea, Japan, Taiwan, China, and other Asian countries that have such a sweeping impact on the technology we use.

To keep you abreast of the big issues in computing, we tackle sticky questions like: Is DOS really on its last legs, and should you be prepared to switch to OS/2? We explore the cultural and historical differences between Apple and IBM, and see how their high-end offerings are alike and yet different. Should you consider buying a Mac instead of a PS/2? We give you the facts—and let you be the judge.

We're committed to covering the human side of computing, too. This means extraordinary journalism like Charles



Fox's compelling story on Stephen Hawking, the renowned physicist who uses computer technology to overcome communications barriers imposed by his physical disability. Fox, himself confined to a wheelchair, gives us a perceptive and telling portrait of an extraordinary personality.

The everyday PC user is important to *PC/Computing*. We tell you about people whose lives are really changed by PCs—from graphic designers to architects to a 13-year-old girl who asked for a computer in a letter to her father. In future editions, we'll report on computers in medicine, law, the arts, entertainment, and other professions where PCs are changing the way people work.

In addition, we'll be providing the information you really need to get the most from computing. That means hardware stories with clear, accurate illustrations and directions, and software reviews with screen samples that really give you a taste of the product. In this issue, we offer help in choosing an accounting program, a laser printer, a hard disk backup program, and an electronic mail service. There's an illustrated, step-by-step guide on how to install a floppy disk drive and a tutorial to help you write AUTOEXEC files, plus departments on the ins and outs of DOS and where to find great shareware, and a help column that'll allay your worst fears about PC setup, maintenance, and repair. Paul Theroux recounts his experiences with laptop computers, and we give you a rundown on the three top contenders in the portables market.

Finally, we're bringing all this to you in a truly beautiful magazine. Design director Lloyd Ziff has produced an outstanding design that complements our editorial with wit, style, and grace, and our art staff will continue to work with top illustrators and photographers to bring you graphic excellence month after month.

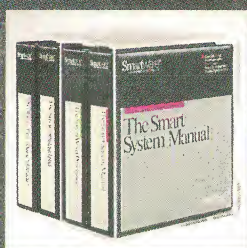
Stephen Hawking says, "One is who one is because of what one does." This magazine is us. We hope it's you too. ■

Nora Georgas

EDITOR

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people, the
difference
is obvious.





“For sheer power, ease of use, speed, and flexibility, you would be hard-pressed to find a more capable product, especially if you need advanced features. It works just as well with a half-dozen spreadsheets simultaneously as it does with one.”

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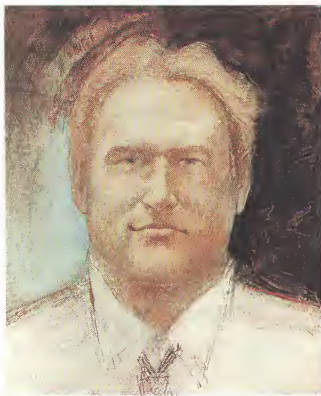
D V O R A K

In 1978, Structured Systems Group, one of the first software companies dedicated to microcomputer applications, moved from a modest Oakland home into a renovated brothel near the Pussycat Theater in North Oakland. The house had been shut down several months earlier by a change in the vice laws and a crackdown in the rampant prostitution that plagued Oakland and Berkeley in the late 1970s. What was once a house of love became a house of ill-dispute as the founding partners of Structured Systems, Alan Cooper and Keith Parsons, began a bitter feud that has yet to end. The feud also marked the beginning of a success story for programming partner Alan Cooper.

Cooper, now 36, doesn't look like a programmer. His stocky 5-foot-7-inch frame and 18-inch neck, combined with his sandy hair and moustache, make him look more like a retired soccer player from a Scottish highland team.

After leaving Structured Systems, Cooper moved south and went to work for Digital Research as a project manager; here, by his own admission, he did virtually no work. Bored, he quit after 18 months, despite the fact that he was suffering the financial repercussions of his feud with Parsons. Near bankruptcy, he became a software author.

What Cooper did was to hole himself up for four months to author *SuperProject*, a so-called CPM (critical - path method) project management program that remains a top seller to this day.



When it was finished, *SuperProject* was eagerly bought by Computer Associates (CA), the world's largest vendor of computer software. CA paid Cooper \$250,000 plus a royalty.

Cooper is a gourmet cook, father of two boys, model-train hobbyist, Oporto wine connoisseur, audiophile, and onetime columnist for *PC World*. On weekends he plays an adventure/survival game called splat ball;

A company with over \$700 million in sales, CA is nonetheless hardly a household name. For example, its spreadsheet program, *SuperCalc*, is hardly discussed in comparative reviews of the great spreadsheet programs. With little or no shelf space in retail stores, CA relies on direct sales to corporations and on resellers who bundle CA's expensive accounting software into larger systems.

A few months ago, Cooper received a call from someone in CA's marketing communications department. "Alan, we want you to stop telling people that you wrote *SuperProject*. Most of it has been recoded, so less than 40 percent of the code is yours anymore. People still think you wrote it and that might confuse our customers."

Cooper shrugs. "Journalists call me and ask me if I wrote *SuperProject*. They

**"We want you to stop telling people
you wrote SuperProject.
That might confuse our customers."**

he dresses in fatigues and roams the back woods wielding a gun loaded with paint balls to shoot at other players.

Cooper, a high school dropout who later returned to junior college to get a degree in computer programming, says most big-league contract programmers earn from \$100,000 to \$200,000 a project. Not bad. But Cooper doesn't do contract programming. He prefers to work for himself in the risky realm of speculative programming—designing something that a company doesn't know it wants until it sees the finished product. A recent mapping program completed by Cooper failed to excite such interest and, to maintain his lifestyle, he now has to come up with something new. None of this is helped by Computer Associates.

want to know something about the software, so I give them a pithy quote and have them call Computer Associates. As far as I can tell, no writer would ever call CA otherwise—nobody seems to know who they are. If CA doesn't want me to refer calls anymore, then I'll just say I don't know anything."

I've always wondered how Computer Associates can be so successful using such arcane marketing and promotion. I finally realized that the company is a reflection of its customers. A stodgy, old-fashioned, big bureaucracy. A dinosaur that survives despite itself, emphasizing the nameless and faceless aspects of corporate America. Heaven forbid a customer may discover that the company bought *SuperProject* from an outside source. Too bad.

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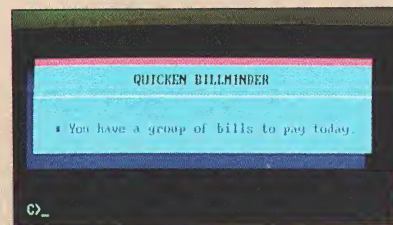
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JEFFREY

B AIRSTOW

H

*elp! You know
I need someone. Help.
Help. Heeeelp!*

—Lennon &
McCartney

I ask myself: Does life really have to be so trying for us poor computer users? Just how difficult would it be for the function keys to work the same way with all programs and on all systems? Why can't programs have a uniform set of function keys for those of us who are set in our ways? What we need here is a consistent user interface.

When was the last time you rented a car and some friendly soul from the rent-a-car desk had to show you how to operate the controls? Although automobiles vary in performance and control configuration, most of us are sufficiently familiar with their operation that we can happily drive off untutored. Would that things were so simple and straightforward with personal computers! Those innocent little gray boxes may all look alike, but they rarely work alike.

In the past few weeks, I've had the experience of pondering the keyboards of several unfamiliar machines loaded with what appeared to be hostile alien software; that's to say, software that rarely responded the way I anticipated. Like most computer users, I hate to read manuals. So I often just plunge grimly on, hoping all will become clear as I struggle through uncharted territory.

Not that I'm afraid to ask for help, you understand.

Indeed, my normal procedure with a strange machine and an unfamiliar pro-



gram is to search for a help key that will call up some sort of explanatory menu. Naturally, no key on a computer keyboard is actually labeled Help. Usually I hit the F1 function key and hope for the best.

But F1 doesn't always produce the results I need. More often than not, the effects verge on the disastrous.

In the past few days, the results of hitting the F1 key while attempting to

membering where the Shift and Enter keys are without trying to imprint an arbitrary duo like Alt-F9 on my debilitated memory cells.

While I'm on the subject, let me cavil about help screens that are merely repetitions of chunks of a manual. Often they go on and on without actually describing the problem at hand. Help screens should be short—preferably only one actual screenful—and not references to other screens or parts of the manual.

Speaking of helping battered users, how about the process of getting back from a series of help screens that delve deeper and deeper into the intricacies of a particular program? Some programs just say "Hit any key to return," but then the cursor keys don't do a thing and the space bar often produces nothing but space.

Why can't programs have a uniform set of function keys for those of us who are set in our ways?



use a variety of application programs have ranged from the expected—with some sort of help screen or other advice popping into view—to the totally unexpected, including, in one case, a sharp exit from the program with the cryptic message "Out of Environment Space." Now do you see what I mean about alien software?

What twisted logic assumes the user will figure out that some oddball key combination like Alt-Z or Alt-F9 will get a help menu? OK, OK, so Alt and Z are adjacent on the keyboard. I'll bet a programmer thought of that one. But what about Alt and F9, especially on one of those awful keyboards that has the function keys spread across the top? Not an easy move for us hunt-and-peck typists. I have a hard enough time re-

How about the Esc key? Whenever I'm in trouble, I prefer to lean on the Esc key until I get back to a recognizable landmark. And without any cryptic messages, thank you very much.

Of course, I do know that some programs allow experienced users to redefine all the keys on the keyboard, including the function keys. The word processing program I use (*XyWrite*) even provides some alternative keyboard configurations—if you can figure out how to load them. The *XyWrite* manual also shows how to write your own keyboard programs, but I gave up on writing computer programs a decade ago.

Then there are some wonderful programs, such as *SuperKey*, that will redefine one key or a set of keys, or even the whole keyboard. But for most of us, re-

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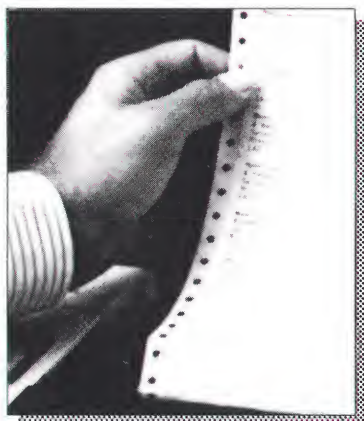
the CGA/EGA/MCGA/VGA/Hercules display adapters. It requires a PCjr through PS/2 or compatible, DOS 2.1 or later, about 70k of memory, but not a math coprocessor. Comes on a 5 1/4" DS-DD diskette. Not copy protected. Suggested retail price: \$30. Check your local dealer. For more information, or to order by mail, just call.



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defining the entire keyboard is like rappelling off a cliff without being certain there's enough rope or a way to climb back up.

The problem with not having a standard keyboard goes way beyond the help key. I'd also like to see some standardization in how the hapless user can effect a disaster recovery. We've all had the experience of working merrily away on a word processor or spreadsheet when suddenly the program locks up without a word of explanation.

Two actions are needed at this point, and both have their place. (Don't tell

**Messing with a
Macintosh is
usually a whole lot
less frustrating
than scratching my
head about
impossible key
combinations.**

me I can reboot; who was the genius who thought of hitting Ctrl-Alt-Del for rebooting, anyway?)

If the disaster is of major proportions, the Esc key should—as in the case of exiting the help screens—take one back to familiar territory, by repeated use if necessary. If it's a relatively minor flub, such as the unwanted deletion of a paragraph, all that's needed is an "undo" key that undoes the last keystroke (and not Tab-Q or some other impossible-to-remember combination).

Maybe I shouldn't mention this in a magazine that's devoted largely to DOS machines, but I long ago discovered an alternative that avoids the keyboard-function-standards problem. It's another three-letter word: Mac. Say what you will about the Apple Macintosh, but it *does* have a consistent user interface. I've been using an IBM machine for several years, but occasionally I sneak into a computer store and mess with a Mac. On the whole, it usually proves a whole lot less frustrating than scratching my head about Alt-Z. ■

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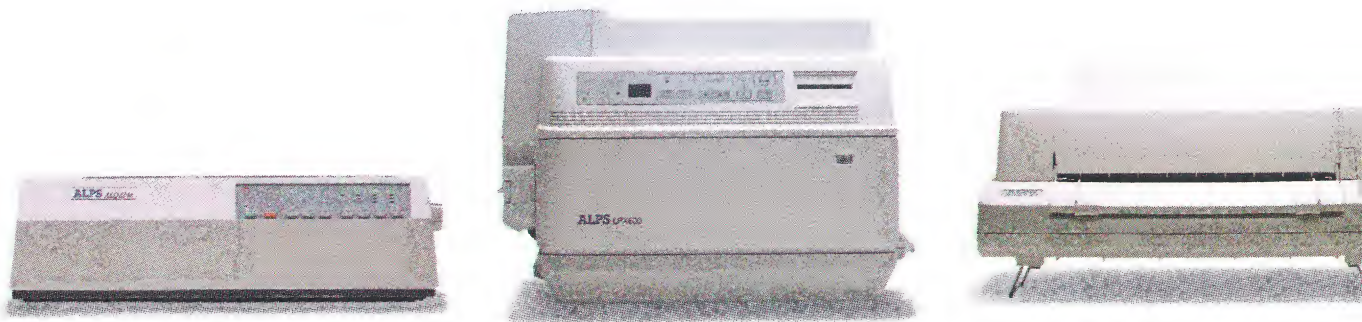
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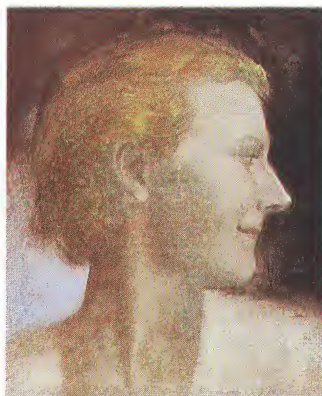
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ESTHER

D Y S O N



When I was very young, I wanted to be a child psychiatrist; I thought myself so fascinating that I wanted to understand how I worked. A decade later, with broader horizons, I studied economics in college because I wanted to understand how the world worked (so that I could change it). It turns out that the economics is fairly dry, and the world is actually run by people. I spent some time at *Forbes*, meeting and writing about what we called "Faces Behind the Figures," and the end of yet another ten years found me on Wall Street, immersed in the business of analyzing computer companies and persuading innocent, ignorant millionaires to invest in them.

Now, ten years later still, I have lost most interest in the business of making and selling computers, but I'm enthralled by what they can do. My ardor won't outlast the decade, of course, but I'd like to explain my infatuation.

What fascinates me about computers is not that they're humanlike, but that they're complementary: they are good at what we are bad at. They're precise, accurate, reliable, and predictable—and boring, unemotional, dry, and uncaring. They can reason, but only with rules and facts, not with intuition and wisdom. They can handle uncertainty as a percentage, but not as a concept.

Much as I love computers, I have come to love them only in their place, which is working for us, not replacing us. I love them for their differences

from us, not for their similarities (that is, people are infinitely better at being people than computers could ever be).

Consider a brief history of modern computers. They began as big batch machines. You submitted "jobs" to them on punch cards; they clanked and creaked and returned results as long fanfolded printouts. These computers did heavy industrial work: accounting, record-keeping, managing

Have you ever ridden a bicycle and felt that it was part of you, that *you* were fast? It gave you power, whereas a train took the power from you as it took you where it wanted to go.

Sometimes you can get the same feeling of power with a PC. You can sort things, organize things, draw things, recall things, find things. The computer has the power—and gives you the power—to manipulate things that would otherwise be tedious. You can create outlines and rearrange them; you can make your software automatically restructure a mass of information by person, by project, by urgency, or by any other criteria you define. You can give a computer data and watch it create recognizable patterns or pick out the anomalies in mostly boring information. You can make (or watch) it do all this,

I've lost interest in the business of making computers, but I'm enthralled by what they do.



massive amounts of not very complex data. The earliest computers knew only yes, no, and sequence.

Over the years, computers have become easier for people like me to deal with. They are now small and quick and can handle complex data: graphics, text, rich structures such as outlines, org charts, and project schematics.

Some years ago Apple used the slogan (attributed to Steve Jobs) "wheels for the mind," handing out T-shirts showing a person riding a bicycle. The analogy is apt. Just as we have both trains and bicycles, so we have both mainframes and PCs. Trains enable us to go farther, but bicycles give us individual freedom. In the same way, mainframes can run bigger businesses, but PCs help us in our individual tasks.

and if you think hard enough, you can understand what it's doing. It's nothing if not predictable.

But try riding that bicycle up the stairs in your house, or cooking an egg while you're still sitting on the bike. There are places a bicycle can't take you—and concepts a computer can't handle. Try getting the computer to write a love letter for you or to predict the outcome of a discussion with your boss; you'll soon find yourself staring off into space.

The computer can take down and display your thoughts, but it can't help you think them. The meaning still resides in the mind of the beholder. The computer can organize the facts, but it can't capture the resonance of your loved one's voice or the peculiar feeling

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you get whenever the guy down the hall calls your boss "Allie"—she's "Alice" to you.

You can input items that have meaning to you, but their meaning is too rich ever to be represented wholly by the computer. The very examples I'm using could sound dry to you unless you too have been in love... or fought for a boss's blessing... see what I mean? (You will if you're a full-hearted person.)

Just as economics couldn't really explain or model the messy, untidy, exciting world of business—with its free

**Computers can
never fully explain
or model the
richness of the
human mind and
soul.**

markets, trial-and-error marketing, and inspired companies (such as the old Apple) breaking out of the pack—so computers can never fully explain or model the richness of the human mind and soul. I've learned not to identify too closely with my machine, or expect it to do more than extend my mind without offering meaning of its own.

We can build software that appears to know things, to imagine things, to create things. But it's all clever programming. The computer can follow your directions, but it can't initiate action on its own. Sometime, somewhere, someone told it exactly what to do, however independently it may appear to be acting.

Even now, computers still know only yes, no, and sequence. All else is constructs—patterns of bits and sequences that I invest with meaning. The better I get at understanding how the computer works, the less exciting it becomes. It just does what I tell it to, even though it does this incredibly quickly. It's not mysterious or magical anymore.

What will I be doing ten years from now? What stands in the same relationship to the computer as business does to economics? As practice to theory? Neural nets? Or could it be child psychiatry after all?

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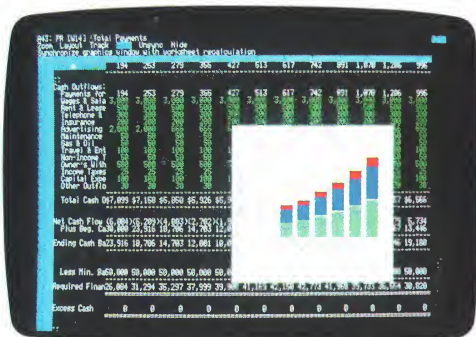
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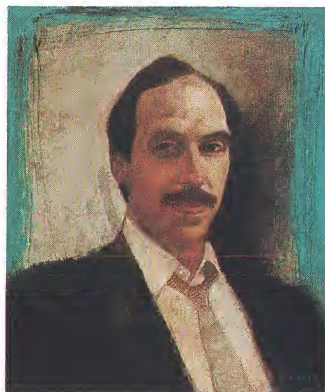
In a scene from the film *Take the Money and Run*, Woody Allen fields questions at a surreal job interview:

Interviewer: "Have you ever had any experience in running a high-speed digital electronic computer?"

Allen: "Yes, I have."

Interviewer: "Where?"

Allen: "My aunt has one."



A decade ago audiences howled at this. But when I recently saw the movie again, I realized that my aunt actually does have one. In fact, several of my aunts do. One runs a small business. Another takes work home. A third bought hers to juggle stocks.

We're talking about normal people here. Not the kind who taught themselves calculus in kindergarten or who can rattle off the first dozen Mersenne prime numbers. Or the ones at the other end of the scale who swear they were kidnapped by UFOs, or who worship a stain in the wall because it resembles the face of Jesus.

PCs are already household fixtures for the next generation of Americans. Earlier this year *The New York Times* ran a piece about a mother trotting her son through the typewriter department at Bloomingdale's. The kid points to a Smith-Corona and asks what it is.

Mom: "That's a typewriter."

Kid: "What's it for?"

Mom: "People write letters on it."

Kid: "But how can they use it? There's no Enter key."

A few years back, editors at computer magazines spent a lot of time beating the bushes for stories on writers, lawyers, engineers, and accountants who actually had—and used—PCs in their offices. These days, the real story is the few business holdouts or heel-dragging authors who still don't own a computer.

Divining your PC future: super color, hotter hardware, and freedom from keyboard tyranny.

What's astounding is that the proliferation of PCs into just about every level of society took place despite the Balkanization of standards and an ornery operating system.

This widespread acceptance is especially remarkable, considering that a big chunk of the population has trouble just using a stick shift or programming a VCR. Many thought they would simply buy a PC, turn it on, push a button, and have the thing magically start doing their work for them.

As a result, the PC market split into two camps. The folks in one group stumbled along without really learning how to use DOS...or just gave up and bought Macs. The other group, relishing the pioneering, puzzle-solving side of computers, rose to the challenge.

However, it's a lot more productive to focus these puzzle-solving efforts on writing a sublime novel or business plan than on finding elegant ways to move groups of files across subdirectories. Maybe DOS version 8.0 or 9.0 will take the sting out of such mundane problems as shuffling files; Windows and the forthcoming Presentation Manager certainly don't. It's not so clear who's going to develop the interface we'll all happily use a year or two down the road. But it is a bit easier to divine other aspects of the PC future:

Color. Some animals and insects are color-blind. Most humans aren't. The ones who claim monochrome is better are confusing color with resolution and dot pitch. Mono is history. And since today's muscular processors can shuffle bytes as nimbly as the older CPUs

moved bits, character-based systems are already giving ground to graphical ones.

Connectivity. You've heard the horror stories—performance degradation, clumsy user interfaces, and control-crazed network managers concocting endless sets of rules to prevent you from getting at your own data. Those are just growing pains. Moving data electronically among users is clearly the future. So is having the Library of Congress at your fingertips.

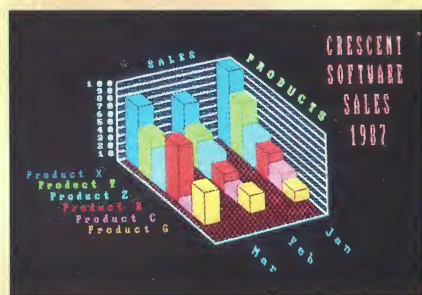
Hotter hardware. Speed-hungry reviewers who gushed when the first 6-megahertz AT hit the streets now wouldn't be caught dead with such a dinosaur. These days even IBM has a 25-MHz 386 system. (Still, most purchasers will just use these as fast XT's.) Clone makers need to push the perfor-

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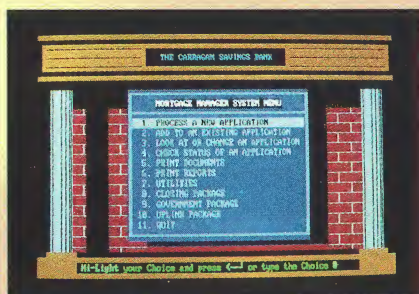
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mance envelope to survive. And spurred by hot laptop technology, manufacturers will continue wedging more power into smaller and smaller boxes.

Slicker software. Yes, it's true, the flood of cheap, memory-packed 386 machines will give developers an excuse to churn out even flabbier, more feature-bloated programs written by even bigger committees.

But on the bright side, the increased processing power will let developers add some genuine software smarts. An easy way is to design software that watches how users operate, and helps

Imagine a "watcher" program that could sit in the background observing how you work and offering helpful advice.

them work better. A "watcher" program could sit in the background, observing how you work and offering suggestions. If it saw you repeating the same key-strokes in a spreadsheet, it could stop and offer to turn them into a macro.

The real problems are that you still have to type in your data manually, and you still have to know the commands that do things like save files or add columns of numbers. Freeing users from the tyranny of the hardware and from unintuitive software is a long way off.

One way to kick things into high gear is to improve voice-recognition technology. Beefy 32-bit CPUs will help. But once your system figures out what you said, it will have considerable trouble figuring out what you mean. Even humans are at least temporarily stymied by a pair of sentences like:

Time flies like an arrow.

Fruit flies like a banana.

The contextual interpretation required to make sense of such lines can bring today's toylike natural-language software to its knees. A simple word like "run" has more than 150 dictionary definitions. And combining such interpretation with voice recognition generates additional headaches, especially since it's nearly impossible to give natural-language software a sense of humor. Would it think Woody Allen meant his aunt had a computer? Or his ant? ■



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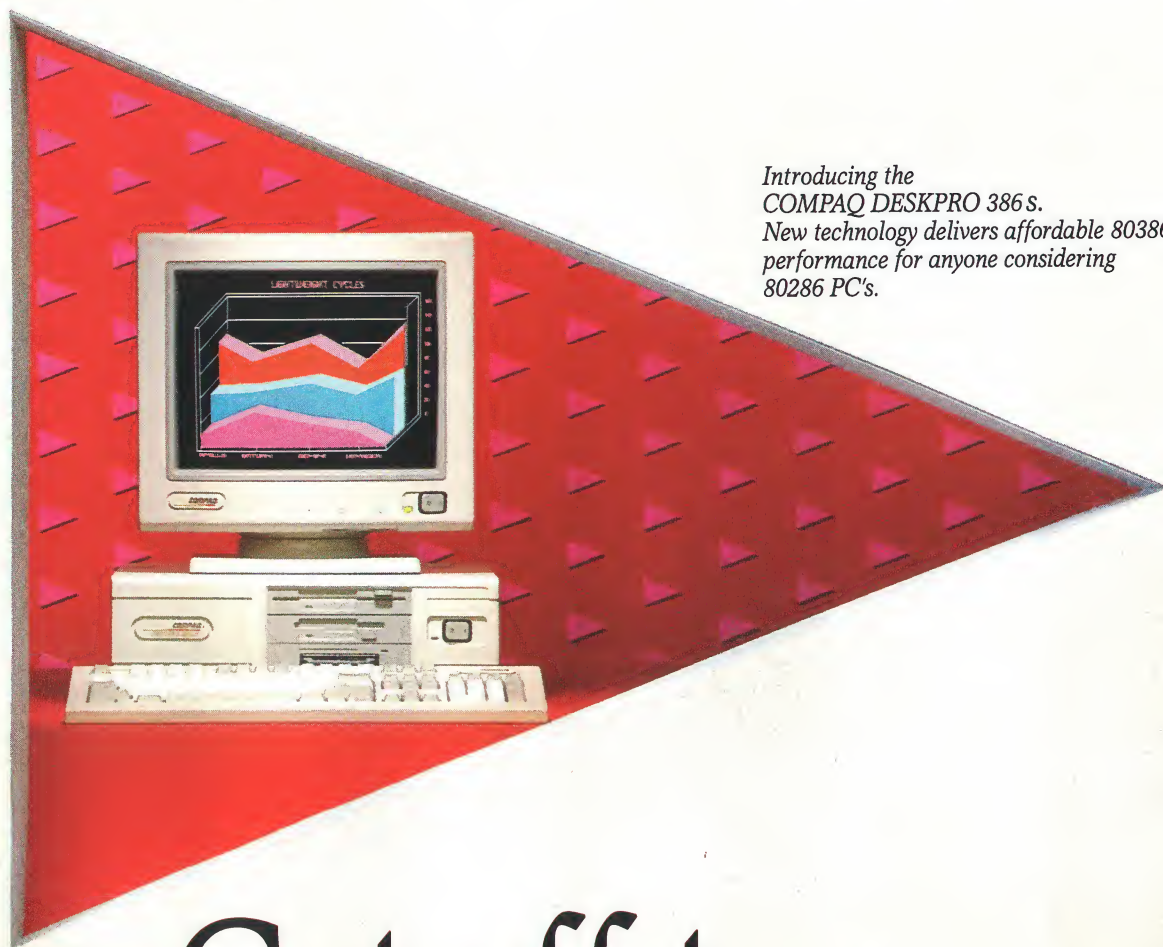
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*Hereafter referred to as 80386SX, 80386 and 80387 respectively.

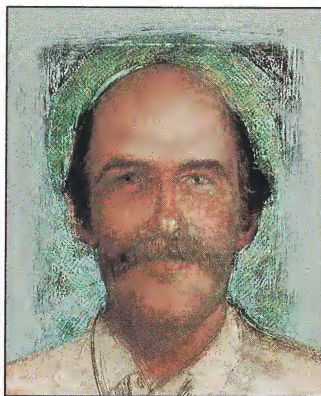
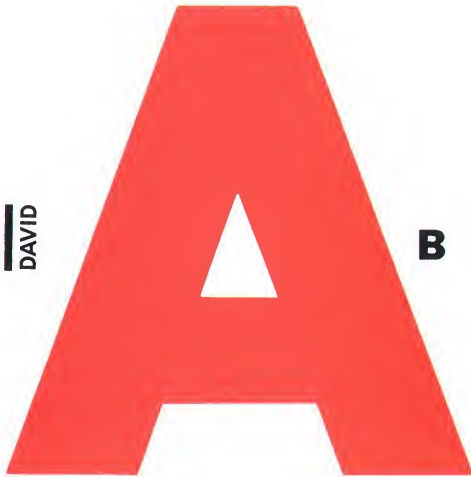
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It began as a dare, almost a bet. Electronic mail is, of course, the wave of the future; it represents the synapses that will soon hold together all our society's communicative neurons. But, warned a good friend, it is currently a next-century system marketed and serviced with *belle epoque* Bulgarian inefficiency. "The problem," he said with a knowing grin, "is simply signing up. Tell you what: send me your first MCI Mail message, just for fun."

And so, last April 28, I called the local MCI e-mail number and was referred to a specific sign-up office. A nice lady named Denise took my name, my mother's maiden name, and my American Express number (for the \$18 needed to open the account) and assured me that everything I needed to get started would be sent by regular postal service in ten working days.

Scroll forward to a month later. I've been quite patient, checking my non-electronic mailbox twice a day, waiting for the package of materials that will splice me into the cosmic net. But nothing has arrived, and it's clearly time to follow up. A call to Denise's number, however, gets me Robert's "phone-mail" instead. His message voice is cheery, frothed with a youthful helpfulness. It says he'll call me back as soon as he can. And a few hours later, he does.

Given his take-charge tone in conversation, I'm sure young Robert can help me. I gladly repeat all the information Denise requested a month before,

plus what she had told me would happen: a package would be posted containing the information necessary for me to begin my new communicative life. Robert reassures me that all will soon be well. I want to believe him—and I do. Except that when I ask him specifically what will happen next, he hedges just a bit. "No problem, but Denise will get back to you."

The best I can do at this point, it

E-mail, I was warned, is a next century system marketed and serviced with belle epoque Bulgarian inefficiency.

seems, is to call Denise myself. Robert thinks that's an OK idea—and even offers to look up Denise's private telephone number for me. Thanking him for all his help, I bid Robert farewell and try to call Denise—but get only her phone-mail machine. I leave a message describing my conversation with Robert. A few hours later, Denise leaves a message for me: "I'm not at all familiar with what you are talking about. I don't believe I'm the person you're looking for. You might want to speak to this person Robert."

When I hear her message, I start to lose control. With my friend's gentle taunt ringing in my ears, I ready myself for a showdown with Denise—and call her back. Five minutes into the conversation, we agree she is a different Den-

ise. She also tells me that she has never heard of the other one. As sweetly as she can, she tells me that someone named Rich will call me.

Rich is Mr. Richard Daley. He lacks Robert's cheerfulness and can-do attitude. Perhaps the reason for this, I find out later, is that Mr. Daley is the national accounts manager of MCI International. I'm not sure what my troubles are doing in his in-box, but I clearly sense the weariness of a veteran problem-solver with an unoriginal problem.

He promises me relief. Indeed, two days later the materials will arrive.

But how, I ask, did my case get so screwed up in the first place? Mr. Daley says he doesn't really know. I press the question. Who, I inquire, is Robert?

There's a pause in our conversation. Mr. Daley decides to come clean.

"Robert," he says with only a hint of resignation, "works in the MCI mailroom. Somehow, when you called—certainly when you followed up, but perhaps even your first call a month ago—you asked for MCI Mail, right? I can't be sure, but I suspect you were simply connected to our company's main mailroom." Another pause. "And they tried to help you." One last pause. "Sorry."

A few days later, I've joined the global web. As agreed, one of my very first messages races out into the ether to my friend. I do not have to note that it is being sent more than a month after our initial conversation.

He's a true and gracious friend. Never one to rub anything in. And, I might thankfully add, not a betting man. ■

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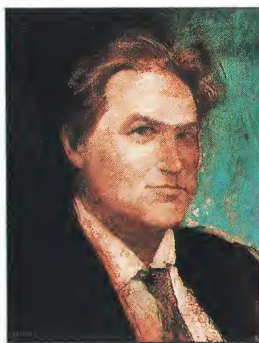
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D VS S

VORAK EYMOUR



Jim, don't you think it's about time this industry grew up and recognized that copyright laws and patent laws apply to this business, as they do to every other business?

Since when are computing machinery and software exempt from such legal protection?

The fact is, Apple Computer holds a visual copyright for its screens and a patent on its use of the mouse and its pull-down menus. Apple is responsible for protecting its copyright and patent. Otherwise, why bother even to obtain them?

The argument hovering over this industry like a vulture over a carcass says that the industry is one big happy family, that we all borrow the best ideas from each other and then make our own improvements. This we call growth.

The promoters of such nonsense then spew a specious argument about standards—boy, are they important. These folks point to automobiles and say it's a good thing all cars have a gas pedal on the driver's right-hand side. Sure they do, but you can be certain the linkage mechanism is patented.

I'd like someone to show me how the clunky *Microsoft Windows* shell improves on the Macintosh interface. The *Windows* shell is a cheap imitation. The latest version of the icon-based Executive exhibits an incredible lack of originality. The fact that the creators didn't have enough imagination to dream up a new metaphor to replace the desktop is a pathetic indictment of the "borrow and improve" argument.

Apple's lawsuit against Microsoft and HP: Justice or disgrace? You be the judge.

NewWave, the Hewlett-Packard product named in the Apple lawsuit, is also laughable in this regard. To borrow from HP's lame ad campaign, maybe HP is just trying to see "what if..." it copies the Mac. Is HP trying to confuse the buyer into thinking, "Gee, I think this is a Mac—it sure looks like one," and deciding, "I'll buy it"? I suppose that's one way to sell a computer.

The fact is, making a cheap imitation that adds no improvement is unconscionable. *Windows* has a mediocre paint program that doesn't compare to the Apple offering, plus a mediocre word processor and a clunker of a windowing system. So where's the improvement? What's the point?

It's clear: Apple has created the interface of the future. Instead of spending a few bucks on R&D and developing something better, perhaps from the same Xerox Star roots whence the Apple interface derives, Microsoft has done nothing more than create a shell program with some utilities so programmers can use it as an environment for

oddball monitors.

Meanwhile, the public is confused. From a distance, and to the layman, the two environments seem identical. Only someone who can play

with both sees *Windows* for what it is: a cheap imitation that sets back graphics interfaces by a decade. The fact is, nobody given a choice uses *Windows*—it's hokey.

But that won't stop its benefactor IBM from promoting *Windows* as the alternative to the Mac. IBM already attempted to steal the Mac's thunder when it rolled out the Model 25. Those who condemn Apple for its legal action justify such chicanery.

It's a fact of life: intellectual property is owned by someone, or it's in the public domain.

This industry isn't a country club; it never was. Apple has every right to sue Microsoft, and that's that. —J.C.D.

Apple's lawsuit against Microsoft and Hewlett-Packard is a disgrace for the company and an embarrassment for its friends, employees, and customers. And the lame excuses of Apple's apologists, including John Dvorak, just make things worse.

By behaving like a petulant child, unhappy with a set of rules it acknowledges it wrote, Apple seems to be returning to those bad old days when the company was run by whim and whimsy. John Sculley has provided remarkably clear-headed leadership for Apple since

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the departure of Steve Jobs, avoiding precisely this kind of whiney, self-defeating stamping of Apple's corporate foot. Why the company should now revert to shooting itself in that selfsame foot is a mystery.

At precisely the moment when, thanks to Sculley and the Mac II, Apple has secured a beachhead in corporate America and is positioned to break out into the general business market, the company breaks the faith with the people who've been saying Apple really does want to be a major information-systems vendor. Amazing.

Few if any observers expect to see this suit go to trial. It's almost universally viewed as a delaying tactic, an effort by Apple to regain in the courthouse time they've lost in the R&D labs. And the most common interpretation of the suit is that it's meant as a message to IBM, an impediment to the Presentation Manager interface due in OS/2, Version 1.1, later this year.

If Apple is worrying that the true multitasking offered in OS/2, Version 1.1, is a serious threat to the Mac's corporate career, the company both undervalues what it already has and misun-

Are Apple and Microsoft protesting too loudly and too long over their lawsuit to the detriment of the rest of us?

derstands its market.

And the whole idea of Apple using legal maneuvering as a kind of punt when it finds it has run out of innovation is repugnant. Apple's successes have been built on better disk drive controllers, mice, graphics interfaces, and the Wozniaks, Herzfelds, and Atkinsons of the world, not on briefs, pleadings, and other excreta from anonymous blue suits.

Apple's taken some bum raps—for example, the notion that Apple stole from Xerox's Palo Alto Research Center some things it actually licensed. And Microsoft has treated Apple shabbily in the past, as in the infamous BASIC war, in which Microsoft's actions verged on

blackmail. Apple people have a lot to resent about Microsoft's past behavior.

But filing suit out of the blue, on specious grounds and against business partners on whom Apple's continuing success clearly depends, is self-defeating and childish.

It's hard to understand exactly what about *Windows* 2.03 might have led to Apple's temper tantrum. Overlapping windows instead of tiled windows? C'mon, everyone knew the earlier tiled windows were an awful idea, a pet notion of Bill Gates that even he came to see as dumb. And has anyone noticed that the other serious windowing systems on the market, including some that are integral to products and unavailable as operating system-level schemes, also use overlapping windows?

Or was it the icons in the object-oriented *NewWave* from Hewlett-Packard that stirred Apple to sue? A lot has been made of the metaphor of the trash can for getting rid of files. The supporting materials filed by Apple with the suit seemed to move things around a bit in the *NewWave* interface, to Apple's advantage; but that's less disturbing than the notion that Apple owns—or *wants* to own—the idea that a garbage can is where we put things we no longer want. What would Apple like us to use? A toilet icon? A diaper-bag icon?

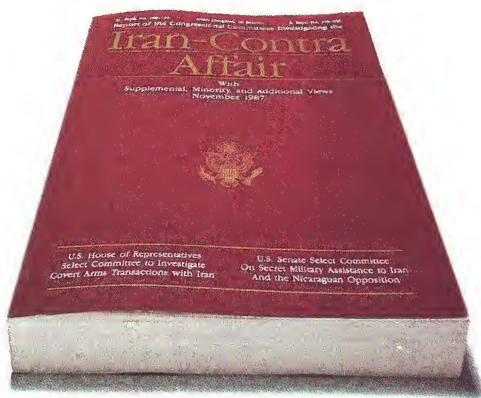
Just how deep is Apple's garbage-can fixation? Should we look for the multicolored-apple logo to be replaced by a multicolored-garbage-can logo—with a bite taken out of the corner?

Companies have every right to defend their intellectual property. But defending the concept of a line drawing of a trash can? Excuse me, is this the same Apple that brought out the LaserWriter and put networking in every machine and a mouse in everyone's right hand? Is there a certain . . . uhh . . . *discontinuity* in the quality of ideas there?

Apple needs to get back to the business it has shown it knows best: enhancing both our productivity and our pleasure in our work lives through systems at once easier to use and more powerful than those of other companies, and through an approach to work itself that never fears to touch our sense of child-like wonder, no matter how deeply it's buried under pinstripes and careerism . . .

And leave the bully-boy tactics to the industry's well-known bullies. —J.S. ▀

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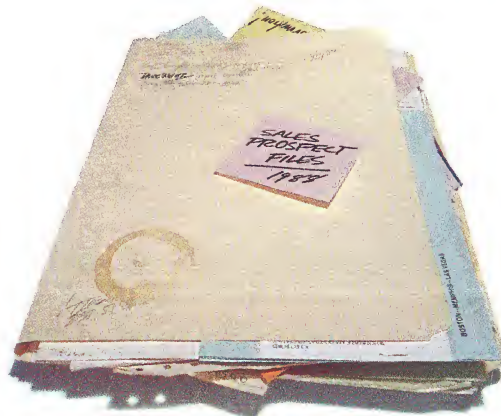
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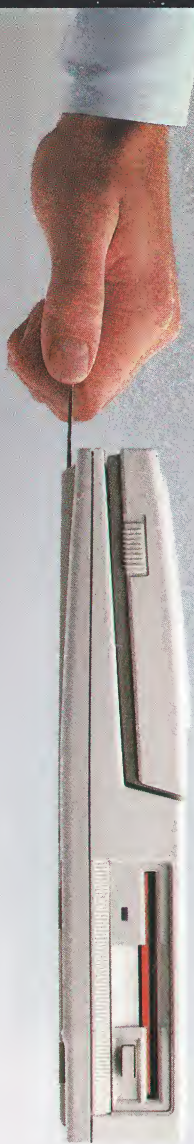
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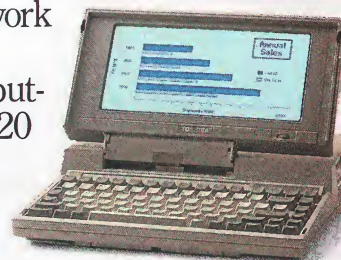
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NEW!

ps/2 clones it had to happen

What if someone gave a standard and nobody came? That's the situation IBM has faced for more than a year. The PS/2—its avowed next standard for personal computers—has won the raves and acceptance of a genetically engineered winged pig. Compatible computer makers have let IBM dance around its Micro Channel alone.

Finally three firms have dared to announce PS/2 clones. Tandy Corp. of Fort Worth, Texas, Dell Computing Corp. of Austin, Texas, and Kaypro Corp. of Solana, California, all promise to sell PS/2 compatibles by year's end.

Although we'll have to wait for them, the machines already exist, at least as prototypes. Here's a rundown on what you may see before the new year:

Tandy has scheduled the summer release of its 5000 MC, an 80386-based computer that's a cross between IBM's PS/2 Models 70 and 80. A desktop machine, it's bigger than the 70 and features five Micro Channel slots plus two proprietary memory-expansion connectors. It's faster than the Model 80, running at 20 megahertz, but slower than IBM's speediest 25-MHz Model 70.

Standard equipment includes 2MB of memory, VGA graphics, and a 3½-inch disk. The machine also has space for three half-height hard or floppy disk drives.

Without a hard disk, the 5000 MC

will list for \$4,999. With a 40MB drive, the system will run \$6,499; for an 84MB drive, the cost rises to \$6,999.

Kaypro expects its PS/2 entry will follow soon after Tandy's. Like IBM's Models 50 and 60, it will be built around Intel's 80286 microprocessor but will be goosed up to 16 MHz (IBM runs its machines at 10). The system unit will be stuffed with five Micro Channel slots and 2MB of memory.

Kaypro has been playing it close to the vest about the new machine and has yet to release pricing information, product name, or delivery dates.

Although pledging the latest release date, Dell Computing also promises the greatest variety. Some time in the fourth quarter the company expects to begin selling a pair of products.

Dell's equivalent of the Model 60, the System 400, features an 80286 chip running at 20 MHz, eight expansion slots, 1MB of memory (expandable to 16), and VGA graphics. Disk storage includes 3½-inch floppies and three sizes of optional hard disks: 40MB, 80MB, and 150MB.

The Model 500 will be based on an 80386 chip running at 20 MHz. Two megabytes of memory, five 32-bit expansion slots, and VGA graphics are standard. Disk storage includes 3½-inch floppies and hard disks from 40 to 610MB.

Pricing for either of the Dell PS/2 clones was not available at press time.

—Preston Gralla

AUTHORIZED CLONES?

The knotty legal web entangling the cloning of IBM's PS/2s became simpler recently when IBM revealed that it will not force a well-known chip maker to obtain a license to sell PS/2-compatible chips.

The semiconductor manufacturer, Chips and Technologies, makes a set of chips that can be used to create PS/2-workalike computers. While IBM will not require the chip maker to license its technology, it will still require companies that use the chips for making PS/2 clones to get such licenses.

Why is IBM being so generous? Or is it? One school of thought holds that the computer giant will require computer manufacturers, rather than chip makers, to take out licenses, because it can charge more for a license on an entire computer than for one on a set of chips.

David LaRiviere, a patent attorney with Schroeder, Davis and Orliss, a Monterey, California, firm specializing in high-tech litigation, notes that IBM has already said it will require computer manufacturers to take out licenses. If it asked chip makers to do the same, it could be accused of "double dipping," or charging twice for the same patent.

What this means to buyers is unclear, except that when the clones do hit the streets, it is likely they will have the IBM seal of approval.

—Preston Gralla

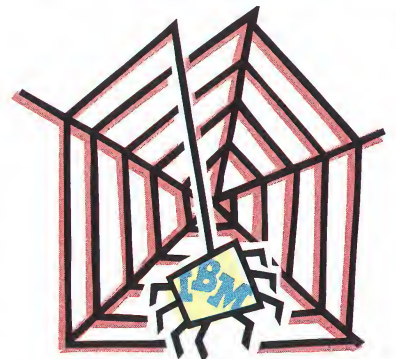
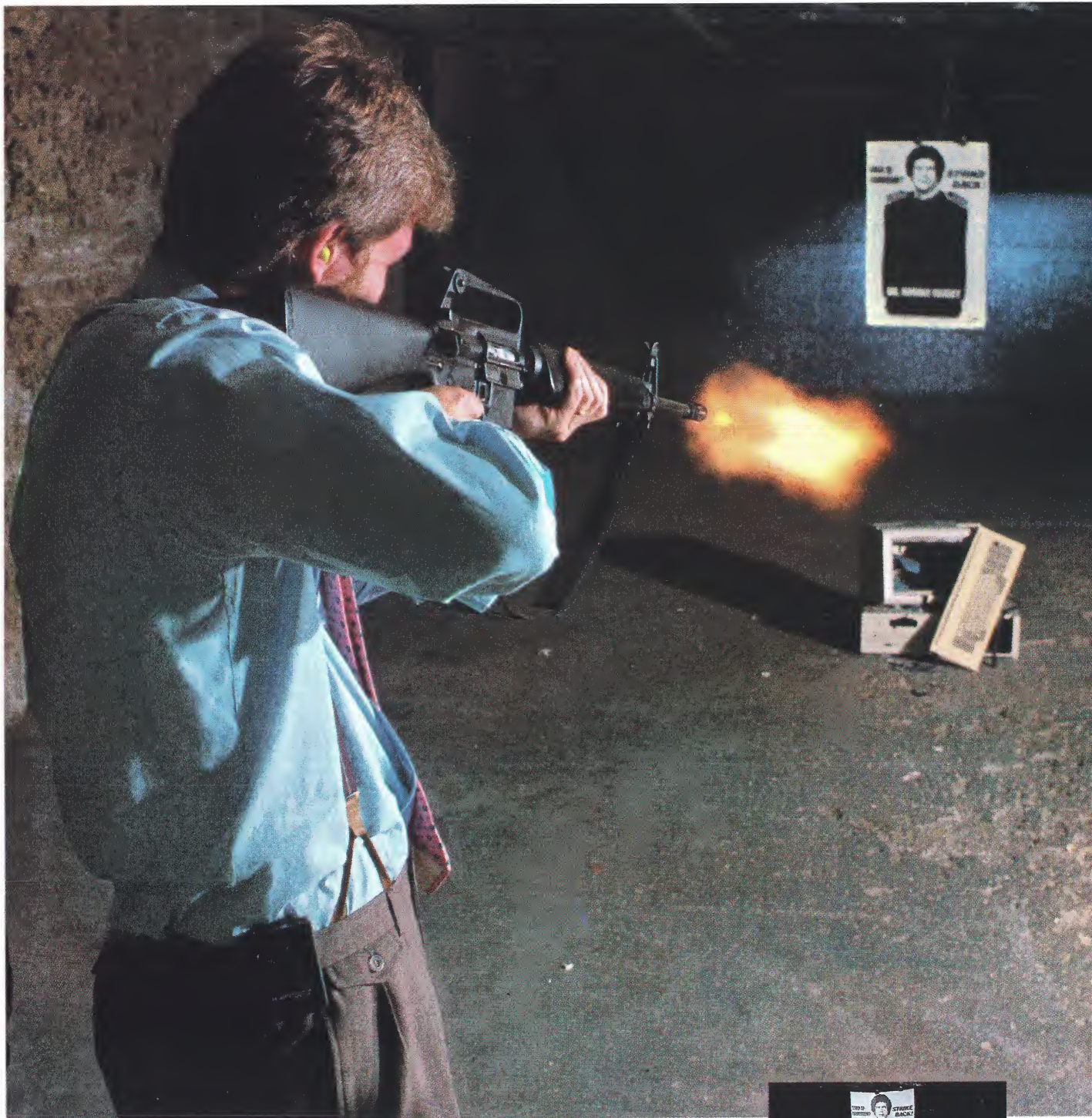


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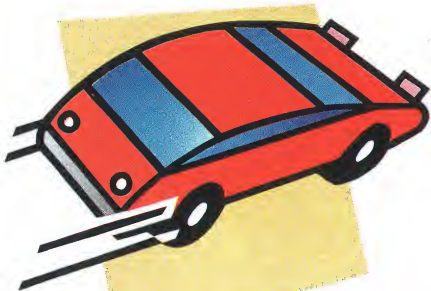


■ ready, aim...

Uzi-packing PC users vent their frustrations at suburban Atlanta's Bulletstop, an indoor firing range. Proud marksmen John and Kim Howse (inset) display their "kill," an old IBM. According to Bulletstop owner Paul LaVista, the range was popular with Comdex attendees, who shot up everything from hard disks to voluminous manuals.



new!



BABY YOU CAN DRIVE MY CAR

We all have a pretty good idea who among us are the driving forces in the personal computer industry, but we wondered what these chauffeurs of PC destiny drive to work. This is what we found out . . .

Rod Canion, president of Compaq Computer Corp., gets to the office in a light blue Mercedes.

Scott McNealy, Sun Microsystems' CEO, shows up in his red Mazda RX7.

Microsoft's chief, Bill Gates, has several cars, including a Jaguar.

Borland's CEO, Phillippe Kahn, gets to work in a white Porsche.

Michael Dell of Dell Computer owns a black Porsche.

Tandy's CEO, John Roach, rides to work in a gray '88 Cadillac. "It's conservative because he's a conservative guy," says a spokesman.

IBM chairman John Akers has a 10-year-old Mercedes sedan.

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With the new 80386SX microprocessor, Intel has severed the connection between the two attractions of the 80386—and made powerful computers more affordable.

The 80386SX is built around the same 32-bit internal design as the ordinary 80386, but it foregoes 32-bit connections to outside circuits, much like the 8088 in the original PC, which uses 16-bit internal construction and 8-bit connections.

The shared internal design means the 80386SX can run exactly the same programs as an ordinary 80386 can—*Windows/386*, *DESQview 386*, *PC-MOS/386*, and the like. But the 16-bit connection sacrifices half the chip's potential speed. Although it operates at 16 megahertz (and possibly faster in future versions), its half-width bus means that moving bytes in and out of memory takes twice as long as the original 80386 chip.

Along with speed, however, Intel has pared the price of the chip down to about \$150—low enough that it's sure to spawn dozens of low-end 80386-style computers.

Intel's prime motivation probably was not magnanimity, however. The old 80386 is costly because Intel has not licensed other companies to use its design, and Intel remains the sole source of supply. That virtual monopoly allows Intel to keep the 80386 price artificially high.

The 80386SX also gives Intel market control. As fast as the 80286, the new chip is more powerful and decidedly more desirable. It effectively makes the 80286 obsolete. That means Intel can thumb its nose at the fiercely competi-

tive 80286 market and take control of the entire 80386SX market.

Monopoly rules, and you pay. Perhaps not as much, but you pay.

Intel 80386SX, Intel Corp., 3065 Bowers Ave., Santa Clara, CA 95051, (408) 987-8080.

half a computer, full of features

Half a computer. That's what you get with Compaq Computer Corp.'s new Deskpro 386S.

It's half the size and has half the bus of other 80386-based computers. But that's good, because it's also about half the price of one of Compaq's monster machines.

The secret: the Deskpro 386S is the first PC to use Intel Corp.'s new 80386SX microprocessor. It has all the features of the plain 80386, and it runs the same software, but it can address only a half-width, 16-bit memory bus.

A truly compact Compaq, the Deskpro 386S is a hair smaller than IBM's PS/2 Model 50 but big enough to hold four 16-bit AT-style expansion slots. The 80386SX runs at 16 megahertz—which means it thinks as fast as most 80386 computers but accesses memory more slowly.

The bottom line—it beats just about every 80286 computer for brute power just as it beats most 80386s on price.

The base machine, which costs \$3,799, includes a high-density, 5¼-inch floppy disk drive, a megabyte of memory, and Compaq's super-quick VGA video board. Adding a 20MB hard disk brings the total to \$4,499; a 40MB hard disk brings the price to \$5,199.

—Winn L. Rosch
Deskpro 386S, Compaq Computer Corp., 20555 FM 149, Houston, TX 77070, (800) 231-0900.

ILLUSTRATION BY JULIA TALCOTT



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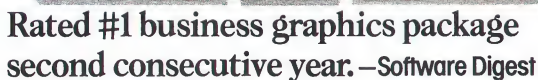
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—Jim Seymour, "Best of '87" PC Magazine



There are a number of prestigious honors in the graphics business. But only one program has captured them all. Harvard Graphics.

Harvard's flexibility, ease of use, and high quality output make it the unanimous choice of the nation's leading software evaluators.

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For upgrade information call 1-800-255-5550.

ps/2 branch out

Lifestyles of the Rich and Impatient: If you want the best and are willing to pay for it, IBM has the box to slide on your desk. The new top-of-the-line PS/2 Model 70 386 (A21) ranks among the fastest—and most expensive—personal computers you can buy.

Smaller than the Model 50, the super-fast Model 70 boasts an 80386 microprocessor, a 25-megahertz system clock, and 64 kilobytes of cache memory. That puts its performance ahead of nearly all the PC competition.

You get three Micro Channel expansion slots (one 16-bit, two 32-bit); space for two 3½-inch floppy disk drives (one is already filled); a quick, 120-megabyte hard disk; VGA graphics; a serial port; a parallel port; and 2MB of memory—all for \$11,295. You supply the monitor.

If you can't swing a second mortgage, you might try the other Model 70s, which have the same chip and similar features. The \$7,995 Model 70 386 (121) slows the clock to 20 MHz. The \$5,995 Model 70 386 (E61) slows it down further, to 16 MHz, and cuts both disk and memory size in half, to 60MB and 1MB, respectively.

Old Dog/New Tricks Department: IBM, castigated over the past year for the dawdling disk and simpering speed of its PS/2 Model 50, has eliminated both in the improved Model 50 Z. The wait states disappear and the 10-MHz 80286 runs up to 35 percent faster. The hard disk is transformed into your choice of a twice-as-fast 30MB model or a faster still 60MB model. With the smaller drive, the new system lists at \$3,995; with the big drive, at \$4,595.

—John Dickinson

IBM PS/2 Model 70 386 (A21), IBM Corp., Old Orchard Rd., Armonk, NY 10504, (914) 765-1900.



Model 50



Model 70

hail and farewell

Say good-bye to IBM's PS/2 computers. Within four years they may be as outmoded as tail fins on a Cadillac, or so says the International Technology Group, a consulting firm based in Los Altos, Calif.

A study prepared by the group contends that PS/2s are merely interim offerings that IBM will metamorphose over the next four years into computers so radically different from today's that they will be unrecognizable.

The group maintains that PS/2s will be split into three distinct lines:

low-end PCs; intelligent workstations; and high-end mini-computers.

Even at the so-called low end, an increase in raw power will be the order of the day, says Clare Fleig, the group's research director. Within the next few years, she believes, even the least powerful PS/2 will feature an 80386 chip.

While there are a number of reasons for IBM's move, says Fleig, one that stands out is IBM's resolution to be a moving target for firms that want to copy its technology.

The computer giant's strategy is simple, she asserts: "They've decided to keep the clone makers one or two steps behind at all times."

—Preston Gralla

OS/2 SIGHTED

Haven't purchased your copy of OS/2 yet?

Don't panic. It's not as though you're the only one left with a Swinger camera or a Betamax video recorder. The dyed-in-the-wool DOS users won't be banished to some Altos-loyalist computing club.

After all, researchers report that most users have no reason even to think about getting the multitasking operating systems until 1990. Even by that time, only 30 percent of all microcomputers sold will come with the new operating system, predicts Jon Yarmis, an analyst with the Gartner Group in Stamford, Connecticut.

And it will take that long for new applications to exploit the OS/2's much-vaunted memory and multitasking capabilities, the features that make the operating system worthwhile.

By 1992, however, it's a different story. Then, shipments of OS/2-based machines should surpass those of DOS computers, Mr. Yarmis says. That adds up to 16.5 million OS/2 units shipped worldwide versus 5.5 million DOS units, according to the Gartner Group's forecasts. —Ann Sussman



new!

atari founder returns

Those of you who suffered the slings and arrows of fine dining at Chuck E. Cheese Pizza Time Theatre restaurants may be relieved to hear that the perpetrator of that enterprise, the bushy-bearded Nolan Bushnell, is back doing what he did best: video games.

Bushnell, 45, started Atari in 1972 with \$250, created the video game industry overnight (with a little help from the Japanese), and sold the company to Warner Communications in 1976 for \$26 million. He went on to Pizza Time Theatres and a dozen other ventures (some even successful, although Chuck E. *et al.* went Chapter 11).

Meanwhile, Jack Tramiel founded Commodore International, led it to success, sold it, bought Atari from Warner in 1984, and is surfing the new wave of home entertainment presently dominated by Japan's Nintendo.

Now Tramiel and Bushnell have cut a deal to develop the next generation of "electronic toys." Bushnell's new company, Axlon, will design computer games for Atari at the rate of 120 games per year. How confident is

Tramiel that Bushnell can still cut it? "They have Japan Inc.," says Jack. "We have Nolan."



NOLAN

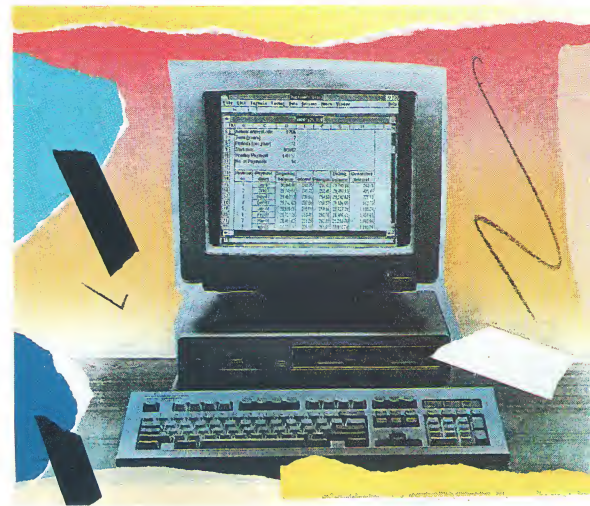
DELL BREEDS A FINE FILLY

Cross a thoroughbred, a wild mustang, and one of today's chi-chi miniature horses, and you'll begin to understand the latest offering from the direct marketing renegades of the Silicon Gulch. Austin, Texas-based Dell Computer Corp. has bred a beast—its System 220—from the best ideas of today's desktop computers, then spurred it for extra speed. Smaller than IBM's tiny PS/2 Model 60, it looks more like a pony. But when its nostrils flare, it gallops along twice as fast, pushing its 80286 microprocessor and megabyte of memory to 20 megahertz.

The styling of the 220 is fully mature—desktop elegance in steel that puts the plastic boxes of the PS/2 line to shame. The 220 packs the same punch as the Model 60, giving you room for two tiny, 3½-inch floppy disk drives (one standard) and hiding a fast, 40MB hard disk inside. As for expansion, the 220 is a thoroughbred all the way—three full-size horizontal slots match the 16-bit IBM PC AT bus.

Although it can't do all of the multitasking tricks that 80386-based computers can, the 220 thinks faster than most of them and will run OS/2. At \$2,999 with a 40MB drive and monochrome VGA display, it's roughly half the price—a bargain if you want a bronco bred for speed.

—Winn L. Rosch



Top o' the List

It doesn't take much to name the computer company that generates the most sales revenue in the nation. Think three letters. Color them blue.

IBM has long been atop the Fortune 500 list. With gross sales of \$54 billion in 1987,

IBM placed fourth on *Fortune's* 1988 ranking of major U.S. industrial corporations.

Of course, sales revenue isn't the only way to make it to number one.

Which computer company generates the most sales revenue per employee? None other than Apple Computer,

reports *Fortune's* arch-nemesis *Forbes* in the Forbes 500 lineup.

Apple generated \$478,500 for each of its 6,400 staffers last year. IBM came in a lowly seventh place on the list. Big Blue pulled in a paltry \$136,800 for each of its 396,400 staffers.

—Ann Sussman

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How to pick th



Though most mice out there look pretty much alike, they're not all equal in performance. It pays to be just a little choosy to make sure you end up with the right mouse for your needs.

Starting with software. If you want full compatibility with all of your software, all you have to do is look for a mouse with the Logitech name. There are four in all, each one designed for different hardware needs.

THE HiREZ MOUSE

If you've got your eyes on a high-resolution screen, the mouse to get your hand on is the new LOGITECH HiREZ Mouse.

With a resolution of 320 dots-per-inch (as compared with 200 dpi or less for ordinary mice), it covers the same area on your high-res screen but needs less of your desk to do it. More than 50% less. Saving you valuable desk space, and

Good instincts run in this family (left to right): the new LOGITECH HiREZ Mouse (\$179), the only mouse designed expressly for high-res screens; the LOGITECH Series 2 Mouse for the IBM PS/2 (\$99, plugs right into mouse port); and the LOGITECH Mouse for standard screens (\$119, in bus and serial versions).

All come with Logitech's own Plus Software, which assures ease of use with virtually any software, mouse-based or not.

effort: mouse maneuvers that used to require sweeps of the hand are now reduced to a flick of the wrist.

Which makes this new mouse a hand's best friend. And a more reliable, long-lasting companion. And, like all Logitech mice, it's fully compatible with all popular software, and equipped with a Lifetime Guarantee.

THE SERIES 2 MOUSE

For those who've chosen the Personal System/2,[™] the most logical choice is the LOGITECH Series 2 Mouse. It's 100% compatible with PS/2, and plugs right into the mouse port, leaving the serial port free to accommodate other peripherals.



The LOGITECH HiREZ Mouse needs 50% less desk space to cover the same amount of screen area as a 200 dpi mouse.



e right mouse.

THE ALL-PURPOSE MOUSE: SERIAL OR BUS

Most people find our standard mouse is still the best choice for their systems. It's available in both bus and serial versions, one of which is sure to fit perfectly with your hardware. And with all your favorite software—whether mouse-based or not.

It's hardly an accident that only Logitech offers you such a complete selection—we're the only mouse company to design and manufacture our own products. We make more mice, in fact, than anyone else. Including custom-designed models for OEMs like AT&T, DEC, and Hewlett-Packard.

The three mice pictured to the left come with all this expertise built right in. Which explains an interesting paradox: while you may pay less for a Logitech mouse, you'll surely get more in performance.

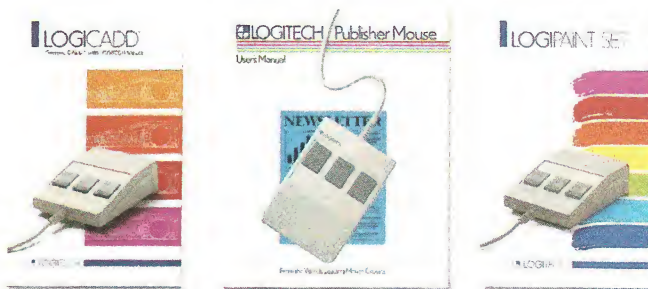


And in comfort. With a unique lightweight ergonomic design. Low-angled buttons for maximum comfort and minimum fatigue. An exclusive technology that guarantees a much greater life span. An exceptionally smooth-moving, dirt-resistant roller ball. And natural compatibility with all PCs, look-a-likes, and virtually any software.

All of which leads to an inescapable conclusion: if you want to end up with the right mouse, start with the right mouse company.

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Turns your PC into a full-featured CADD workstation. Everything you need for dimensioned line drawing and CADD.

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Company/Title _____

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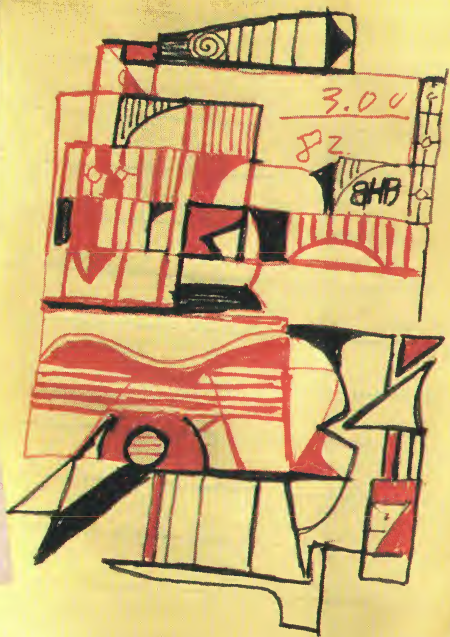
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LOGITECH

Personal System/2 is a trademark of International Business Machines, Corporation.

Intel announces the end of computer generated graphics.



This primitive piece is obviously the result of a waiting period. Most probably from the AutoCAD™ era.



*"Dream On," or "What To Do While Your PC Is Indexing"
Pen and ink and dBASE III.**

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paradox unleashed for 386

new!

2 80386 PC without 32-bit software is like a Lamborghini stuck in traffic. It's got a lot of potential, but it just can't go anywhere.

Enter *Paradox 386*—a sophisticated relational database marketed by Borland International, and one of the first programs to take full advantage of the 80386 microprocessor. Most DOS software uses 16-bit instructions to ensure compatibility with the older 8088 chips. *Paradox 386* sacrifices that compatibility in order to exploit the ability of the 80386 to carry out 32-bit instructions.

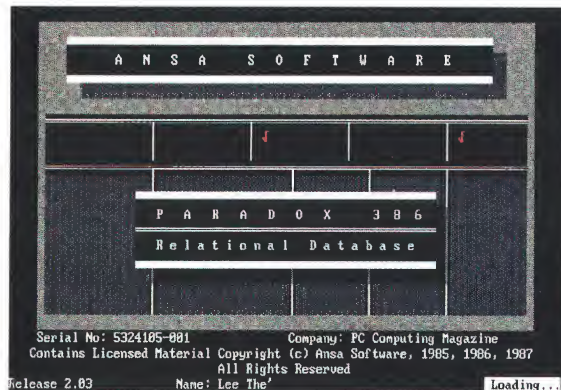
Databases are notorious sluggards, wasting vast amounts of your time while they tediously match and reject records. By harnessing the speed of the 80386 chip, *Paradox* can chew through employee records or parts inventories faster than you can add sugar substitute to your second cup of coffee.

To speed, *Paradox 386* adds other virtues: files created by its predecessor, *Paradox*, Version 2.0, are compatible; multiuser and network capabilities are standard; it handles up to 2 billion records per table and up to 4,000 bytes per record; and it offers automatic updating, multilevel password protection, and a wealth of reporting capabilities.

With these capabilities, *Paradox 386* may take a bite out of the market for high-end PC databases. At press time, sources said Ashton-Tate's long-awaited *dBASE IV* was not scheduled to include support for the 386 in its "native" (32-bit) mode, and Fox Software was the only developer to deliver a 386 version of its popular program, *FoxBASE*.

With its major competitors still in the pits, Borland is betting *Paradox* will better its position in the crowded database field.

—Winn L. Rosch
Paradox 386, \$895; Borland International Inc., 4585 Scotts Valley Dr., P.O. Box 660001, Scotts Valley, CA 95066, (800) 543-7543.



■ Paradox can chew through employee records faster than you can add a sweetener to your second cup of coffee.

THUNDERING THOR, BATMAN—AN ERASABLE CD

■ **C**ompact disks have taken the music industry by storm. Just try to find an LP of your favorite recording artist; chances are you'll have better luck if you, like millions of music aficionados, go optical.

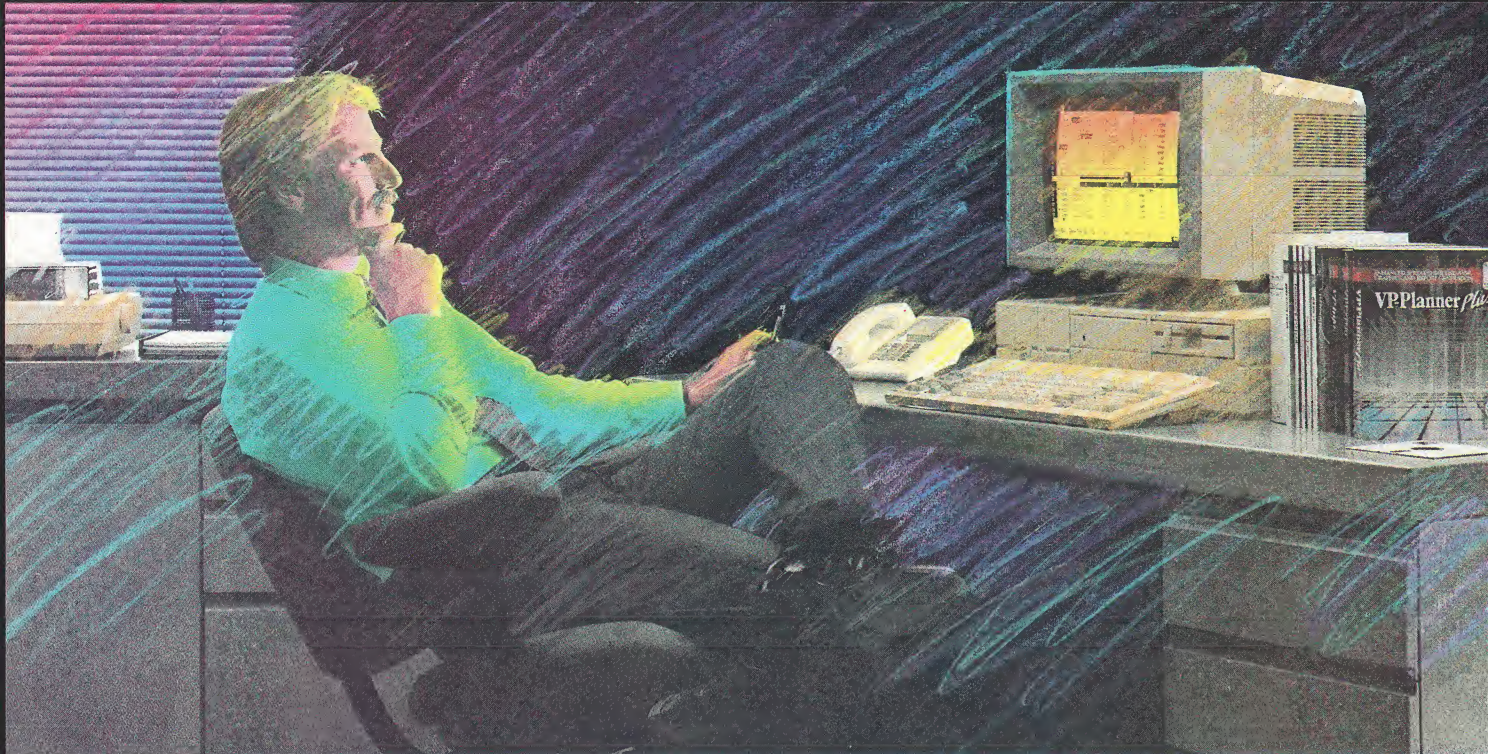
■ The winds of that storm are blowing through the PC industry, too. Optical disks hold an astonishing amount of information, but with one catch: once data is on them, the information cannot be altered. Because of this, CD-ROMs are used primarily for archival purposes, or as a way of distributing databases and software.

■ But that may change, according to Tandy Corp. The firm has developed a technology, which it calls Thor-CD, to allow CDs to be read to and written from, as are floppies and hard disks.

■ Thor-CD works much like conventional CD technology—it stores data by using a laser beam to carve microscopic pits into a light-reflecting disk. The breakthrough, says Tandy, is that its technique allows those tiny pits to be erased and written over.

This will allow CDs to be used in lieu of floppies or hard disks, but with one very big difference: some CDs have capacities of over a gigabyte—the equivalent of 50 20-megabyte hard disks.

All this won't come soon. Hardware to take advantage of the new technology will probably not be on the market for another 18 months, notes a Tandy spokesman. And it will come at a price, possibly \$1,000 for the hardware and several hundred dollars for each disk.



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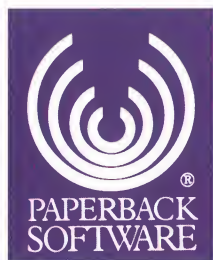
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Division	.39	2.42	2.00
Exponentiation	.39	8.68	14.00

All times in seconds.

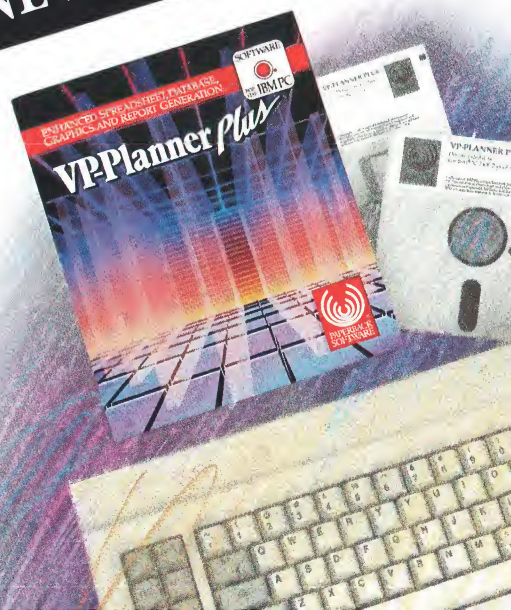


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Introducing VP-Planner Plus From Paperback Software.

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NEW VERSION



new!

OPTICAL IMAGES



the champ is back

Xerox beware! Aldus is back—with *PageMaker 3.0*, which began shipment at the end of May. With nearly identical editions for the Mac and PC, the new package addresses what had been one of the earlier *PageMaker*'s greatest shortcomings: its inability to wrap text across multiple pages. With the click of the mouse, you can now import an entire word processing file in page format.

Aldus has also given *PageMaker* style sheets which, with another click of the mouse, allow quick and easy selection of font, paragraph, and color settings from an on-screen palette. You can also tag styles directly in your word processing program—for instance, by bracketing a style command like “subhead” with greater-than and less-than characters—before importing the text to *PageMaker*.

To wrap text around graphics you need as much drawing talent as a five-year-old with a crayon and a blank

piece of paper: simply outline the graphics, and *PageMaker* automatically runs the text around the art.

The high level of compatibility between the DOS and the Macintosh versions makes *PageMaker* a practical purchase for offices with both systems.

One caveat: this release needs a lot of overhead. Think big in terms of processing power (an 80386 is a must), memory (at least 640 kilobytes, but the more, the better), and monitors (a PC with an EGA card supports only 16 colors).

All in all, the package that propelled desktop publishing to the forefront has gotten bigger and better. And while it still lacks some of the features important for long-document processing, such as footnoting, index generation, and automatic figure numbering, *PageMaker* is still the most flexible page-layout package available today.

—Diane Burns

Aldus PageMaker, Version 3.0, Aldus Corp., 411 First Ave. South, Suite 200, Seattle, WA 98104, (206) 622-5500.

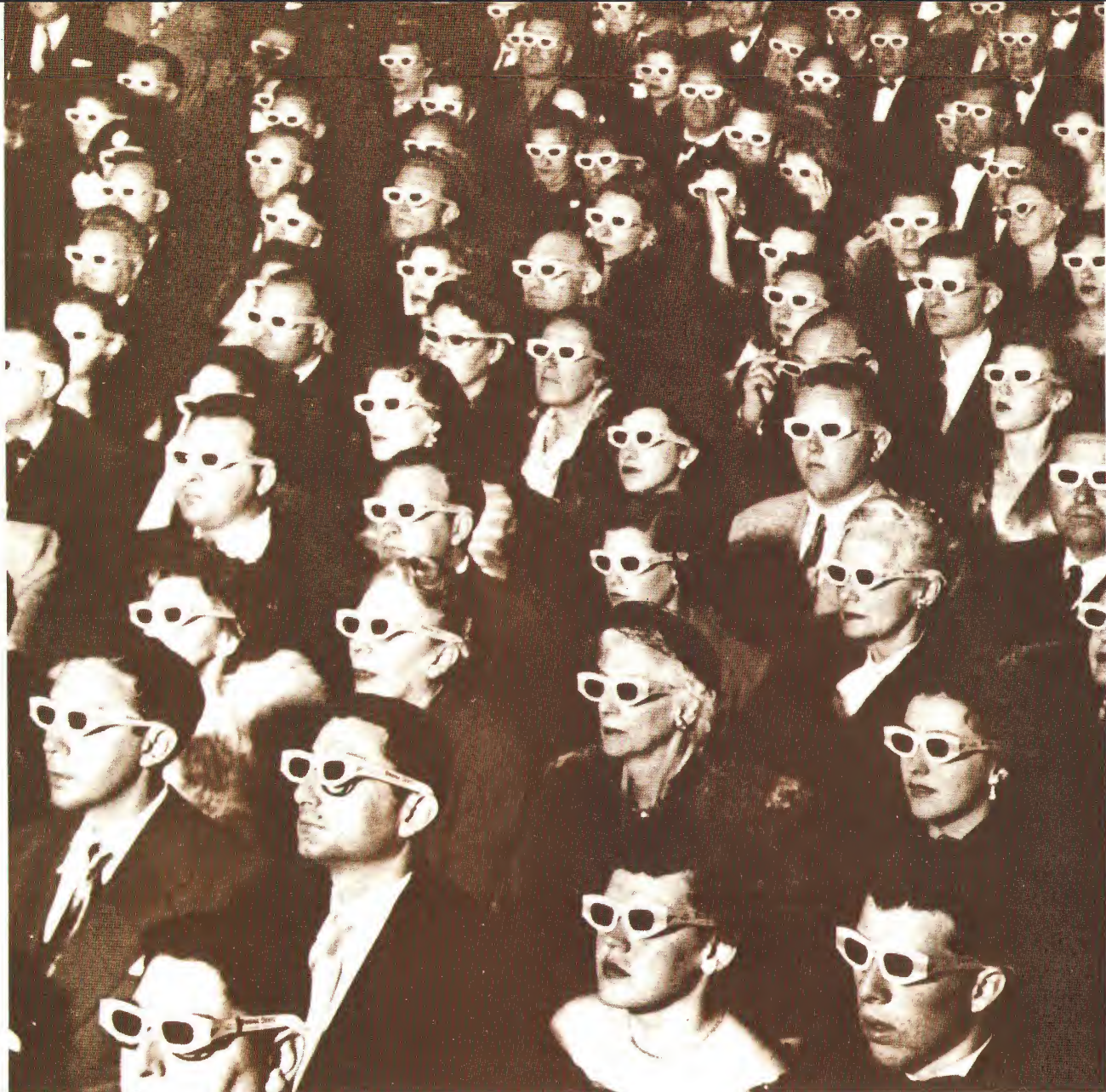
Just when you'd convinced yourself that now wasn't the time to invest in a CD player as a PC storage device, NEC Home Electronics has come along, eager to convince you otherwise. The firm, out of Wood Dale, Illinois, has released its first CD-ROM player and two CD-ROM software disks. The items aim to accommodate, even to please.

The CD players come in two models, one to fit inside a PC and the other meant to sit alongside it. The software libraries are for people who like to add artwork to everything their PCs print out.

Clip Art 3-D has more than 2,500 three-dimensional pictures. It comes with line drawings of people sitting at desks, walking, running, and so on, as well as dingbats, lightning bolts and giant exclamation points. *Image Folio*, NEC's second CD release, is a library of more than 4,000 color stock shots with views of sunsets, factories, and everything in between, including the Statue of Liberty. Both are priced at \$399.

The external CD-ROM player, at \$999, works with IBM PCs, compatibles, PS/2s, and Apple Macintosh computers. Add \$199 for an NEC interface kit that attaches the player to the computer. The internal CD-ROM is slightly less expensive, at \$899.

—Ann Sussman



doctor, my eyes!

Bring back those fifties monster-movie glasses: the PC is going 3-D.

Tektronix, well known for its high-end workstations, has created a 3-D stereo imaging system that works just as well—if somewhat more slowly—on a PC as it does on considerably more-expensive dedicated workstations.

In the real world, you see in stereo because your eyes are several centimeters apart. Each eye sees an object from a slightly different angle. Your brain fuses those two images

and the result is a perception of depth.

The Tektronix system plays a similar trick. It generates two discrete images and displays them on a special monitor that has liquid crystal “shutters” embedded in the glass. Polarizing glasses allow each eye to see one, but not both, of the images. And voila! 3-D stereo for personal computers.

Naturally, this visual skulduggery isn’t cheap: the monitor and a 286/386-compatible video card run about \$9,800.

But then, the folks who are using the system aren’t exactly low-budget, accord-

ing to Sat Narayanan, marketing manager of the Liquid Crystal Shutter Division of Tektronix. Molecular chemists, for example, are using it to draw molecules that exist only in their imaginations. In addition Narayanan expects telerobotics and training simulations to emerge as a strong 3-D stereo market.

It will be a while before this gear trickles down to your local computer store, but just imagine how much fun *Flight Simulator* is going to be in 3-D.

—Steve Blount

REACH OUT

How many times has it happened? You're far from your PC and forgot your copy of *XyWrite* or you brought along the wrong version of a file.

What to do? Well, you could go all the way back to your PC to retrieve your programs and files. But there's a better solution. You can load one of three revamped remote communications programs onto the nearest PC equipped with communications software and a modem.

Each of these recently updated packages—*Remote²* from Crosstalk Communications/DCA, *pcAnywhere III* from Dynamic Microprocessor Associates, and *Carbon Copy Plus* from Meridian Technology Corp.—is actually two programs in one: a memory-resident program for the host and another (not memory resident) for the PC doing the dialing. These programs allow you to take control of a far-off PC and execute programs almost as if you were sitting at your distant desk.

If you're worried about hackers calling in, two of these packages—*Remote²* and *pcAnywhere III*—offer an automatic callback feature that prevents direct access to the computer. When you call in you simply give a preassigned password, and the program calls you back.

Remote, introduced by the Roswell, Georgia firm in 1980, is the granddaddy of these packages, and Version 2 removes some of the clunkiness of the original package. For instance, the first version required a separate communications package to establish connections; *Remote²* includes this feature. The program also offers a proprietary file transfer protocol that prevents you from retransmitting files from different directories. Should you lose part of a file during transmission due to a faulty phone line or other problem, you can retransmit from the middle of the file.

Carbon Copy Plus from Meridian Technology, Irvine, California, adds background file transfers so that the PC



calling in can transfer files while someone runs another application on the host. Unique is *Carbon Copy Plus*'s Universal Graphics Translator, which allows you to transfer graphics files from one graphics format to another during the transmission process. *Carbon Copy* also includes a script language that automates such communications tasks as dialing up an electronic mailbox and checking for new messages.

New York-based Dynamic Microprocessor Associates' new *pcAnywhere III* allows you to talk on the phone without exiting the programs running on the PCs (although you can't talk and transfer data at the same time). Its automatic callback feature is also new.

With these packages, you won't have to worry if you forget your stuff at home. Just call in and get it.

—Frank Bican

new!

i've been slimed

Who's responsible for the thousands of scrambled and demagnetized automatic teller machine (ATM) and credit cards each year?

An accusing finger has been pointed at the hagfish, alias "slime eel," used to make wallets and handbags.

Theory has it that a goo exuded from the glands of the hagfish may be responsible; but a more likely culprit is the tanning process, which may leave metallic residues that can carry a magnetic field.

Less imaginative folk offer a third possibility: consumers who place the cards near magnetic fields.

—Chris Johnston

WE THE PEOPLE

Here's your chance to become a bona fide one-person pressure group. For just \$49.95, *Congressional Toolkit* will guide you through the morass of committees, subcommittees, chairpersons, and ideological agendas. It will also help you compose and mass-mail correspondence to any or all of them.

Toolkit includes vital stats on all current members of Congress. By choosing options from a menu, you can select politicians by name, state, party affiliation, or the committees on which they serve. Then, using a mail-merge feature, you can personalize a stock letter for each of them. You can create the letter using *Toolkit*'s built-in word processor or use the data with your own software.

The standard version of the software (from BJ Toolkit, Croton-on-Hudson, New York) has the federal database or a single state database built in. Additional state databases are \$39.95 each. —Chris Johnston

PC MOUSETM AND AUTOSKETCH[®]



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Ever think you'd use your PC to draw anything but your salary? Probably not. Because CAD and mouse drawing tools have always been either too complicated or expensive. Or their results were strictly mickey mouse.

Until we bundled AutoSketch — from the makers of AutoCAD — and PC MOUSE — from the original mouse company. The two standards in graphic precision for anyone who wants to draw with a PC. Serious or not.

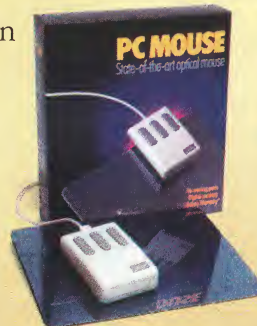
Even if you've never used PC drawing tools before, in very little

time you'll find AutoSketch lets you create charts, diagrams, illustrations, or just about any kind of line art you need. And, with PC MOUSE, you can draw, copy and move shapes and symbols around the screen at the touch of a button. Just pull down a menu, point and click.

The *only* mouse that uses advanced optical technology, PC MOUSE has no moving parts. So it not only gives you smoother hand control and digital pointing accuracy. It also elimi-

nates the need for cleaning and maintenance. Which is one reason why it comes with a *Lifetime Warranty*.*

So ask your dealer about the new bundled package that gives you serious CAD drawing tools. PC MOUSE and AutoSketch.



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CIRCLE NO. 135 ON READER SERVICE CARD.

new!

If you think computers are primarily boys' toys, statistics bear you out. The U.S.

Department of

Labor reports that women account for only 20 percent of computer systems analysts and scientists. And men are more likely to purchase PCs than women: males bought three out of four of the 9.5 million computers purchased for the home in 1985, according to DataQuest, the San Jose-based market-research firm. All this means the Women's Computer Literacy Center had its mission ready-made when it opened in San Francisco six years ago. Founder Deborah Brecher drew on a conviction that women shouldn't be left out of the computer revolution. "I realized women were lagging behind in dealing with computers out of some kind of phobia," she says.

CLOSING THE GENDER GAP

The Women's Computer Literacy Center holds classes in cities across the country. Some 5,000 women have completed the \$275, two-day course. To make key concepts clear, Brecher uses lots of homey analogies. A print buffer, for example, is like a bathtub being rapidly filled with characters (or water) that flow slowly out the drain (to the printer). If the level of characters (water) reaches the top of the buffer (bathtub), the tap (CPU) is turned off until enough characters have drained out. . . .

—Traude Gomez



scanning the message

Scanning books, letters, and other documents into your PC can be a bit like typing with your eyes closed. Sure, something gets on the page, but the number of mistakes likely to crop up makes the effort less than worthwhile.

Most of today's scanners feature optical character recognition (OCR) software that struggles to produce error-free electronic files. The devices usually can read only a handful of typefaces, so it's common for an *a* to come out as an *e*.

The designers of the new Kurzweil Discover 7320 Model 30 claim to have changed all that. The Model 30 incorporates a new version of Kurzweil's homegrown intelligent character recognition software that can read the proportionally spaced type found in books, magazines, and newspapers.

Thanks to the software, the scanner can "understand" a far greater range of letters than can most OCR scanners, a Kurzweil representative said.

The new intelligent recognition software enables the scanner to read multiple columns in a single pass. That may sound simple, but column recognition is a big deal for machines. Most scanners require you to scan columns of a magazine article one at a time, then add instructions about proper column placement on the page.

Kurzweil also offers software that endows the scanner with multilingual capabilities—French, German, Italian, Swedish, Spanish, and Dutch, to be exact. To make working with the scanned documents possible, scanned files convert to the ASCII or to the DCA format supported by most word processors.

Desktop publishers, take note: the scanner can handle graphics at 300-dots-per-inch resolution, but it lacks the sophisticated image processing software often bundled with scanning systems. The Model 30 supports standard graphics file formats such as PC Paintbrush from Z-Soft and TIFF.

A word of caution: the Model 30 doesn't work with Micro Channel PS/2 computers or Macintosh computers.

All this razzle-dazzle comes at a price. And at \$13,950, the Model 30 is clearly not in the same ballpark as the under-\$1,000 hand-held scanners recently delivered by Logitech, Mitsubishi, and others.

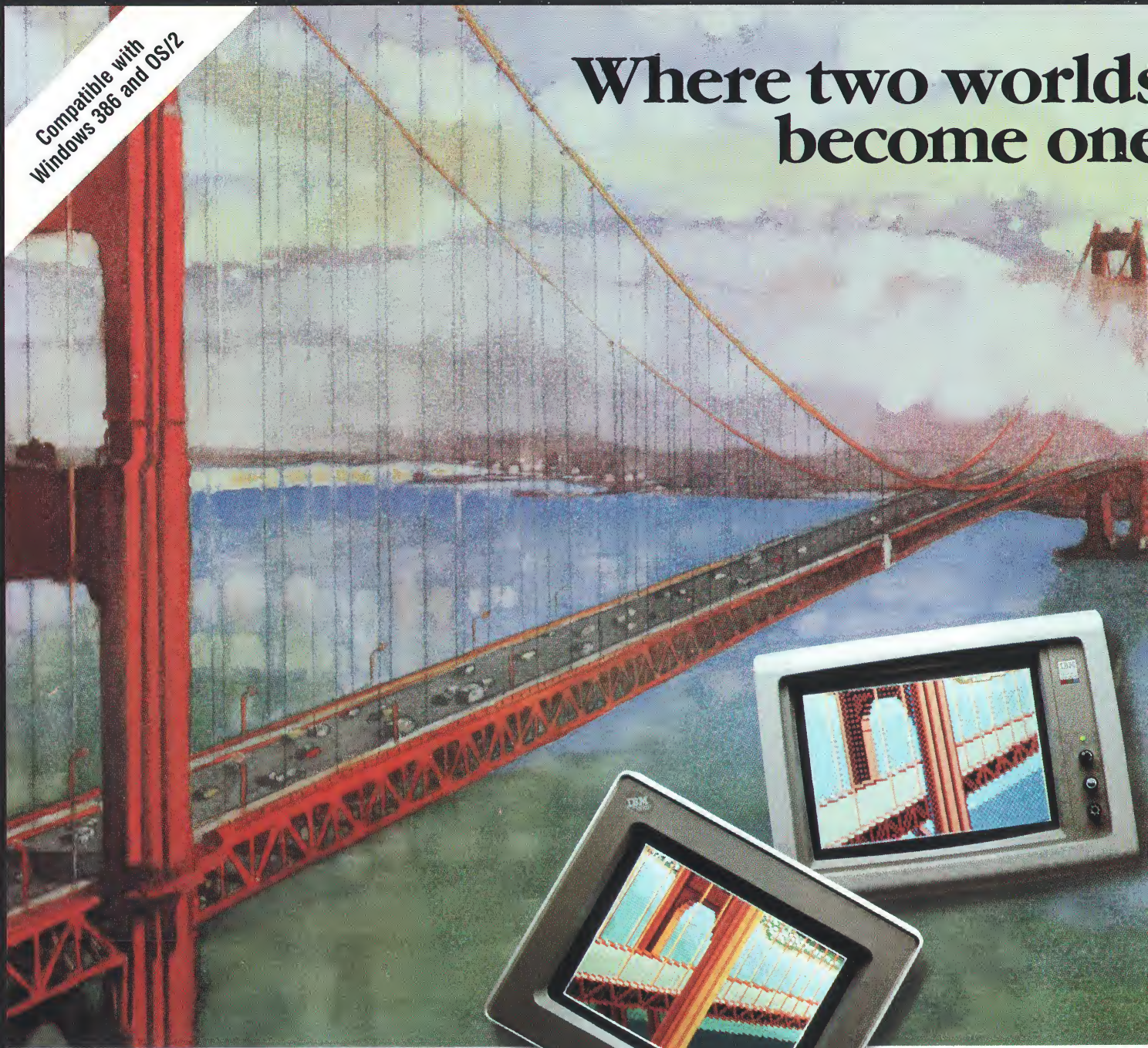
But the price tag shouldn't keep legal firms and government offices, which spend millions on data entry, from looking at this product with some interest.

—Tom Stanton



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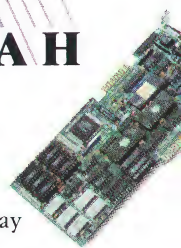
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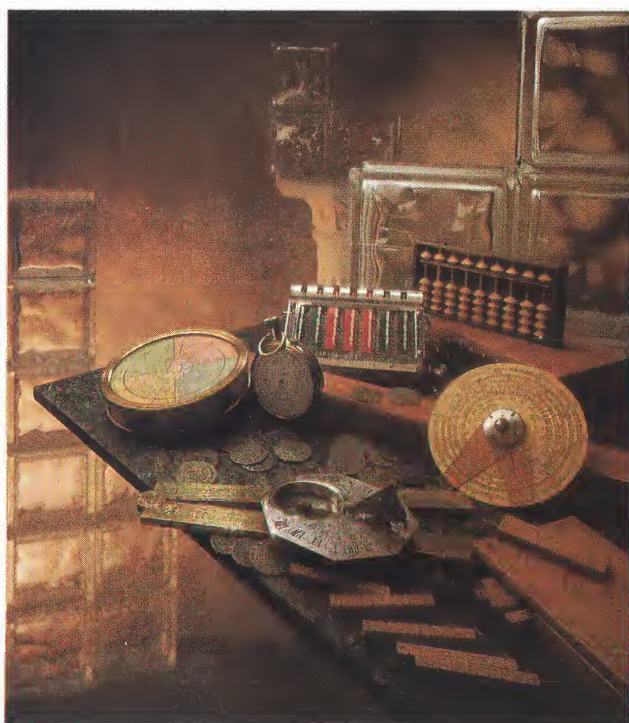


S I G M A D E S I G N S

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new!



showtime

Computer-nostalgia buffs will find the gadgets of their dreams at "Computers in Your Pocket: The History of Hand-held Calculators," an exhibition that gets underway at The Science Museum of Virginia, Richmond, this month.

Pocket electronic calculators have been around for 20 years. But portable tools that make math easier have been around far longer. On display are 64 "rare and unusual" items that trace the human need to count and to record what was counted, according to a spokeswoman for The Computer Museum, Boston, which organized the exhibition.

The show features 17th-century Napier's Bones, rods made of bone that astronomers once used to remember multiplication tables; and adding machines such as the two-gear Webb Adder, patented in 1869. And then there's the machine designed by the Englishman Samuel Morland in 1666, which is credited as being the world's oldest mechanical pocket calculator; and Hewlett-Packard's HP35, developed in 1972, which was the world's first scientific hand-held electronic one.

You'll even find a 3,000-year-old counting aid called "Shepherd's Pebbles," used to keep track of sheep.

The exhibit was fashioned from objects from The Computer Museum's collection. Funded by Hewlett-Packard and organized by the Smithsonian Institution Traveling Exhibition Service, the show will tour the country for the next two years.

—Ann Sussman

"Computers in Your Pocket: The History of Hand-held Calculators" will be traveling to museums throughout the country for the next two years.

MOBILE STORAGE

Not so much a passport as a bill of lading, Plus Development Corp.'s removable hard disk drive takes the tedium out of moving the ones and zeros across the frontier separating the PC and PS/2 Micro Channel computer architectures.

The Plus Passport drive is a two-part device. The first part is mounted into your PC or PS/2 and includes a host adapter card, a controller, and a bay. (An external bay is also available.) The second part is the removable cartridge, which contains the hard disk platter, drive head, and motor.

Use the Plus Passport as an ordinary hard disk drive, then press a front-panel button. Obediently, the cartridge slides out of its dock. Push this drive-cum-cartridge into another machine, and you've just moved multiple megabytes in seconds.

Drop the cartridge into your briefcase to travel, or pop it into a safe to secure sensitive data.

Plus Passport 20MB drives retail for \$595, and the 40MB drives sell for \$795. Don't start cheering yet. You'll also need base housing for the drive, which goes for \$349 for the internal model or \$399 for the external chassis; a PC adapter for \$299 or Micro Channel adapter (for PS/2 machines) for \$399; a mounting kit is included. Add it all up, and the base retail for a single bay with a 20MB cartridge for a PC is \$1,240.

—Winn L. Rosch

Plus Passport, Plus Development Corp., 1778 McCarthy Blvd., Milpitas, CA 95035, (800) 826-8022.

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WAITSTATE	ZERO	ZERO	ZERO	1
SYSTEM MEMORY	1024K to 16MB	1024K to 16MB	640K to 16MB	640K to 16MB
CACHE MEMORY SIZE	64KB	64KB	32KB	—
KBD. SELECTABLE SPEEDS	YES	YES	YES	YES
COPROCESSOR SUPPORT	80287/387	80387	80287	80287
32-BITSLOTS	—	1	—	—
16-BITSLOTS	6	4	6	6
8 BITSLOTS	2	1	2	2
SERIAL PORTS	2	2	2	2
PARALLEL PORT	1	1	1	1
HARD DISK/FD. CTRLR.	YES	YES	YES	YES
1.2MB 5 1/4" OR 1.44MB 3.5" FD.	YES	YES	YES	YES
ROM BASED SETUP/DIAGNOSTICS	YES	YES	YES	YES
POWER SUPPLY	200W	200W	200W	200W
ENHANCED 101-KEY KBD.	YES	YES	YES	YES

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new!

SPEEDY POSTSCRIPTS

Can you grab a cup of coffee, gossip a while with your underlings, and complete *The New York Times* crossword puzzle while you're waiting for your PostScript printer to output the newsletter you just designed?

Help may be on its way. A Silicon Valley microprocessor manufacturer has introduced chips that it claims will speed the operation of the notoriously slow PostScript by as much as 40 times.

The Weitek Corp. of Sunnyvale, California, has developed a set of chips that will run Weitek's version of PostScript, the page-description language made famous by Adobe Systems. The chips will become the heart of a new generation of PostScript-compatible printers that Weitek officials say will be 5 to 40 times as fast as the original PostScript printer, Apple Computer's LaserWriter.

The Weitek chip may also make PostScript-compatible printers a little cheaper than the ones we've got today, and its effect may even be felt on non-PostScript lasers like Hewlett-Packard's popular LaserJet Series II, according to John Rizzo, Weitek's vice president of marketing. The chips won't force down prices on LaserJet compatibles, but they will pressure non-PostScript laser makers to increase the speeds of those printers, Rizzo believes.

But like much else in the computer industry, the benefits of such a chip are forecast for some future time. As we went to press, we had yet to see a printer that used the new chips; Rizzo estimates the first ones will be ready by the end of this year.

—Preston Gralla



pcs behind bars

"Somebody got it all wrong and went bonkers," said a Mississippi Department of Corrections spokesman. What "somebody" got wrong was the department's accusation that an inmate at the Parchman correctional facility was responsible for the disappearance of 74 bales (about \$20,000 worth) of unginned cotton—and that the convicted embezzler had committed the caper using a computer. What was bonkers was the accusation turning up as the lead to a *New York Times* story about computer crimes.

The inmate, whom officials declined to identify, impressed his administrative superiors with his computer savvy, a skill sorely lacking in the prison. Contrary to prison policy, he was given free rein of a state-supplied, standalone PC for word processing and other office tasks, such as keeping track of employee hours.

The prisoner, who is serving a 30-year sentence, was alleged to have used the computer to alter money orders for profit. The orders were drawn up in small amounts, and then the printed figures were changed to appear larger.

Corrections officers investigating the incident discovered that the inmate had also used the PC to write letters petitioning for his own early release, signing other people's names to the letters. They also discovered he owned a Radio Shack laptop with a built-in modem—a definite no-no for inmates.

"We found that it would have been possible to access the prison computer with the Radio Shack, but it would have been extremely unlikely," said the department's spokesman. "Only an expert with access to our mainframe computers could have done it."

Although the prisoner has not yet been charged with any crime, his Radio Shack computer has been confiscated and he no longer has access to the administrative PC. The spokesman also noted that forged letters seeking his own early release will probably affect parole decisions in the prisoner's future.

"They might decide he hasn't yet learned his lesson," the spokesman added.

—Chris Johnston

OFFICE WORKS

If price is no object and there is a network in your future, then *Office Works* may just be the information manager of your dreams.

This premium program, from Data Access Corp., Miami, Florida, goes far beyond other information managers. Extensive electronic mail facilities, phone messaging, security control of documents, and facsimile transfer are only some of the features it offers.

The big plus for *Office Works* is its support of the kind of network likely to be encountered in the typical small office. It can be installed on networks that use Novell's *Advanced NetWare* (2.0 or later) or on any of the NetBIOS systems, such as the IBM PC Network and 3Com.

Office Works is hardly inexpensive—come August, the network version will cost \$1,395.

—Frank Bican

This is for everyone too busy to get organized

If you're the type of person who's too busy to read an ad, read this ad.

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You can record the thousands of tasks you need to address to put

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Which means, now you can concentrate

File View Item Category Print Utility System Quit New, Remove, Position, Assign, Discard, Undiscard		
Scratchpad	Who	Issues
• Forward product comparison articles to Joan.	• Joan	• Competitive Tracking
• Can we get the cost of goods sold under \$12?	• Tom	• Materials
• Bob will present ten-point incentives program at sales conference.	• Bob	• Bonus Dollars
• Tom will have his report in by a week from Friday, make sure it covers pricing, strategy, distribution, and implications of using outside vendor for typesetting and printing	• Tom	• Distribution Vendors Pricing
• Decision needed on research budget by end of this week—discuss options with Jim and Joan.	• Jim Joan	• Research

Items. Dump information in manually, import it or use our pop-up capability while in another program.

Dump any random, unrelated thoughts or ideas into Agenda, and it'll help you turn that information into a stream of structured, actionable knowledge.

projects, and information with incredible efficiency. A tool that will help you avoid slumping into your chair, shaking your head, and asking, "How on earth will I ever get this done?"

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Everyone who's any work done.

File View Item Category Print Utility System Quit
Column, Section, Management, Info

Issues	Product Ideas	Who	Department
• Packaging	• Accept packaging bids until the end of October.	• Liz	• Operations
• Materials	• Make sure synthetic materials are reliable.	• Sue	• Operations
• Research	• Have Tom break down market research results into best case/worst case scenarios.	• Tom	• Marketing
• Distribution Vendors Pricing	• Tom will have his report in by a week from Friday, make sure it covers pricing, strategy, distribution, and implications of using outside vendor for typesetting and printing.	• Tom	• Marketing
• Distribution	• Do Tom and Bob think we need to adjust distribution mix?	• Tom • Bob	• Marketing • Sales

Categories. Agenda files items in all relevant categories so you can always find the information you need.

File: C:\AGENDA\FILES\ISSUES 06/21/88 11:00
View: Issues by Person

Issues	Joan	Priority	When
• Research	• Decision needed on research budget by end of this week—discuss options with Jim and Joan.	• High	• 06/25/88
• Competitive Tracking	• Forward product comparison articles to Joan.	• Low	• 07/07/88
Issues	Bob	Priority	When
• Distribution	• Do Tom and Bob think we need to adjust distribution mix?	• High	• 06/22/88
• Bonus Dollars	• Bob will present ten-point incentives program at sales conference.	• Medium	• 06/29/88

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different ways so you can pinpoint information that's important to you. Or discover new relationships you hadn't considered before. And anytime you change an item in a view, Agenda will

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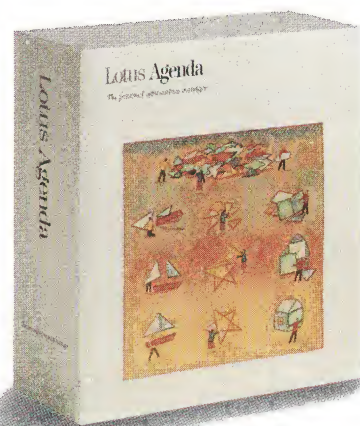
automatically update all other categories where the item has been assigned.

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How does IBM's PS/2 Model 80 stack up against the Apple Macintosh II?

By **LAWRENCE J. MAGID** and
MARTY JEROME

AS A COSMIC QUESTION, it ranks right up there with "What is the meaning of life?" and "Is celibacy a viable option?"

The question is: "Should I buy an IBM PC or an Apple Macintosh?"

Of course, like most Cosmic Questions, it's a tough proposition. There are too many variables, too many undefined terms, too many open-ended issues.

What do you mean by "PC"—one of the classic PC/XT/AT machines made by IBM? A clone made by one of its many imitators? Or an IBM Personal System/2, one of IBM's new line of personal computers? And do you mean a PC running DOS or OS/2?

And which Macintosh? The Mac Plus or SE, the current versions of the original hobbit-like creature that crouches on the desktop, all self-contained and user-

friendly? Or the Mac II—much more powerful, much more user-definable—that Apple Computer has aimed like Cupid's bow at the heart of Corporate America?

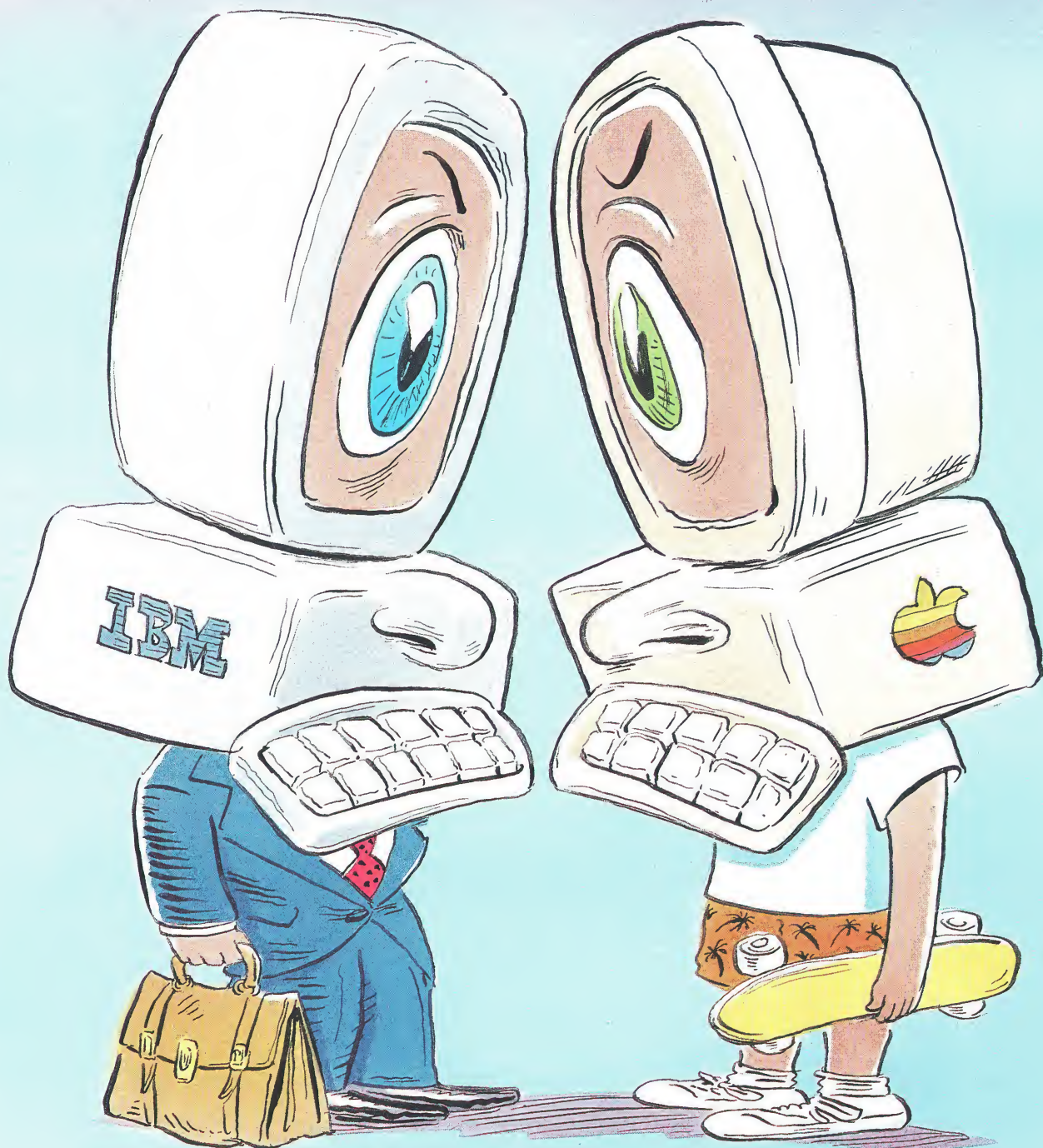
The fundamental basis of the choice rests, of course, not on the computers, but on

your self-image and worldview. Are you a liberal or a conservative? Are you laid-back or hard-charging? The reason you are faced with a choice at all has less to do with the two manufacturers' respective capabilities than a dualism in the American sensibility, a split in the collective psyche. Apple makes right-brained computers. IBM makes left-brained ones.

A well-versed Macintosh user resembles a seasoned short-order cook at work, managing half a dozen unrelated tasks in full-tilt batch mode. The Mac user drifts nimbly in and out of programs, shooting an untethered cursor at arcane pictures on the menu; booting up, changing, and storing a flood of images in split seconds; working without ostensible reason or method.

The Macintoshes are intuitive, graphics-centered

Lawrence J. Magid is a columnist for the Los Angeles Times and senior editor of The Computer Show. Marty Jerome is associate editor of PC/Computing.



R. GROSSMAN

machines. They invite exploration and play. They function from a private vocabulary of corny pictures and spatial relationships. Information seems secondary to form.


Apple's trademark is the user-friendliness of its computers, a downright conspiracy of West Coast good humor. This is due in part to the use of the mouse (what else would Apple call it?). The soft, imprecise hand-eye coordination it demands has a mildly humbling effect. And, yes, Apples are polite machines, beaming with the mechanical warmth of a Berkeley graduate student who has agreed to edit your thesis.

IBM's ubiquitous PC-XT, the Pontiac Bonneville of business machines, likes things articulated. It has an alphanumeric mind, a stoic, project-oriented demeanor. All IBMs are marvelous at organizing and managing massive volumes of informa-

With PS/2 comes improved graphics. Suddenly, IBMs are turning up in schools and universities, once the domain of Apple.

tion—in spreadsheets, databases, word processing indexes, or files on a floppy disk. They are methodical, plodding machines. They hunger for raw data; form is something you format and forget.

Don't waste an IBM's time: if you can't type, get someone who can. The machines will remind you of every imprecise keystroke. They will begrudgingly and laboriously give you graphics—even good graphics—but they prefer words and numbers. They are eager computers, but demand some intelligence in the driver's seat. They are professional—like a newly minted

 The day after IBM announced its plans to enter the personal computer market, Apple picked up the gauntlet with a full-page ad in *The Wall Street Journal*. The headline read, "Welcome IBM, seriously."

That was 1981, in the days when Apple was given to such glibness. At stake was more than its stellar market share. Apple was out to defend its intellectual property and birthright, the very notion of what personal computing is about.

But then, Apple has always been about crusades. Its mythic beginnings and its evangelical bad boy, Steven Jobs, continue to play heavily on at least one side of the American dream. It is true that the first Apple was built in Jobs's parents' garage by loner/whiz kid Steve Wozniak on money raised from the sale of Jobs's Volkswagen bus and Wozniak's Hewlett-Packard programmable calculator. And it is also known that Jobs lived in a commune and became a multimillionaire before he was 30. Apple Computer was built by such visionaries, misfits, and West Coast individualists. Its early, spectacular growth carried with it a breezy California arrogance that was virulently antiestablishment, antibureaucratic, anti-East Coast. It presaged the 1980s buzzword "entrepreneur." Apple was the company of tomorrow, where office attire meant jeans, T-shirts, and running shoes, and

WHIZBIZ

no one kept regular hours.

Its machines emulated their creators. The first Apples were friendly, open standalones. Astoundingly malleable and tolerant computers, they responded to the most rudimentary of typing skills. To Apple engineers they were the ambitious, populist tool that would set loose millions of individual rags-to-riches stories. The machines were the gospel.

Meanwhile, the other side of the American dream was taking shape in the gray corridors of an obscure industrial complex in Boca Raton, Florida. It featured buttoned-down, pinstriped team players, nickel-nosed managers, and highly motivated movers. It was IBM, of course: the Establishment's establishment, one of the largest multinational monoliths in the world.

IBM wanted to move personal computing from the lunatic fringe, wrest it from kids and West Coast flakes, and put it to work in Corporate America to fit the way Corporate America was already being run. An information society needs a standard. IBM was quick to point out that its middle name was Business, whereas apples were a kind of fruit.

But IBM's PC was late to market. In its scramble to hedge Apple's burgeoning influence, IBM turned out a machine with open architecture similar to that of the early Apples, but built from

off-the-shelf components (IBM didn't even make the box it came in) and driven by a widely unknown operating system that had been licensed from a bunch of whiz kids at an obscure company named Microsoft. The PC's philosophy of design was the diametric opposite of the Apple's.

Where the Apple II offered a chaotic array of incompatible standards, the PC was the perfect (if boardroom-somber) team player, comfortable with a host of peripherals and interfaces. It was the tool that would raise productivity, enhance intercorporate communication, and pump sunshine into the bottom line. It was not about inventing the future.

The question of whether Apple will ever be asked to join the club, or whether IBM will learn to work in bare feet, is academic. The two companies find themselves struggling over the same turf—the corporate marketplace that buys the lion's share of high-ticket personal computers. The inevitable result of the competition is that their products, if not their corporate cultures, are evolving in ways dictated by corporate customers.

That two companies with such opposing values, missions, and origins are competing head-to-head is an "only in America" kind of story. That their products should be co-evolving, becoming less hostile toward each other and easier to use together, is good news for us all.

—Marty Jerome

Harvard MBA making lists of things you want done.

The XT's successor, the AT, meant more horsepower under the hood, pure and simple. It could do more and do it faster, but it was the same dour, amazingly useful computer as the XT. It was a company man.

The current line of PS/2s blurs this analogy and invites comparison with Apple's Mac II.

The semiclosed architecture of the PS/2s makes them much harder to clone. This is IBM's way of reclaiming its intellectual property, of telling the cloners their free ride is over. Also, with the PS/2 comes a tremendously improved graphics capability. Suddenly, IBMs are turning up in schools and universities, once the domain of Apple.

For its part, the Mac II now comes with more than modestly open architecture. In addition, many of its peripherals are produced by third-party vendors. This has helped Apple push open the door to the boardroom, a market it lost to IBM a mere three years ago.

Perhaps everything that rises truly does converge: at the top of each manufacturer's line, the machines (Apple's Mac II and IBM's PS/2 Model 80) begin to look surprisingly similar.

Both are built around microprocessors that can manipulate 32 bits of data at once—the Motorola 68020 for the Mac, the Intel 80386 for the Model 80. Both processors run at a very fast 16 megahertz (and both have recently announced faster speeds—a 25-MHz IBM and a 33-MHz Mac). Their expansion buses (IBM's Micro Channel and the Mac's NuBus) are 32 bits "wide"—they can move data around the computer in 32-bit chunks, which increases both the operating speed and the memory-addressing capability of the machines. And it's possible for each bus to address multiple external devices simultaneously. Currently, virtually no applications take advantage of such multitasking muscle, but future applications under OS/2 or Apple's MultiFinder may exploit the potential.

If the PC world and the Mac world really are converging, why are Mac users so unswervingly loyal? The most frequently heard reason—the same one that prompts the Mac faithful to put "DOS: Just Say No" bumper stickers on their cars—is ease of use. Conventional wisdom says the Mac wins this battle hands down.

Well, maybe.

One big advantage to the Mac is that you're up and running minutes after you uncrate everything. Plug it in and go.

IBM has been slack in this regard, for years selling bare CPUs without the essentials needed to run them—the equivalent of selling cars with optional steering wheels. Big Blue forced buyers to take things apart with screwdrivers, flip dip switches, buy components separately and hope everything would work together. No more. You still have to buy the operating system sepa-



rately, but the new IBM Model 80 is sold as it should be: unless you need more than the standard 1 or 2 megabytes of memory, just plug it in and go. You can be up and running just as fast with a Model 80 as with a Mac II.

But is the Mac really easier to use? For a long time there was no argument. Remember the anticipation of turning on your first PC? `C: >` was a pretty bleak greeting, and things got worse from there. The Mac, on the other hand, glowed softly to life revealing friendly little pictures, called icons, on the screen. The implicit message—"See? No tech... no problem"—was instantly imprinted on the consciousness of a generation.

This powerful image still lingers. But times have changed, even if operating systems haven't. The fact is, fairly cheap and very good programs called DOS shells make life easier today for IBM users. These shells hide the ugliness of DOS behind a more seemly facade of menus and flashy features; for \$50 or \$75 you'll never again have to stare at a `C: >` prompt, trying to remember syntax.

That said, let's look at the value of the Mac's icons. The Macintosh uses icons instead of names to identify each file's purpose. Icons are effective if there are only

a few on the screen. But for users with hundreds or thousands of hard disk files to manage, shell menus and filenames are less confusing than a screen full of friendly little pictures.

Think about it. The essential idea of icons is that a picture communicates a concept more quickly and easily than a word. But consider that uncomfortable moment we've all spent staring at the icons on restroom doors, trying to figure out which one was for *caballeros*. Multiply that frustration by the number of files on your hard disk.

Of course, you don't have to use icons. Mac II also lets you assign files by name, and these can be sorted by date, by size, or alphabetically. But a graphics-oriented worldview is deeply embedded in the genetic code of the entire Mac family. Even if you choose to name a file rather than assign an icon to it, Mac uses pictures for commands. To erase a file, for example, you click the mouse button on the file's icon (or its name) and drag it across the screen into a trash can icon. Many find this a more tedious process than typing DEL.

Let's say you want to run a program. The Mac's operating system, MultiFinder, files hierarchically, just like DOS. On either system, the program you want may be buried in a subdirectory (Mac calls them folders) three layers down. Mac's Find File utility can help by telling you where the file is. But you still have to get there, which in this case means navigating through three levels of folders, pointing and clicking the mouse.

**One big advantage to the Mac
is that you're up and running minutes
after you uncrate everything.
Plug it in and go.**

With an IBM you could, of course, go through the same navigation exercise, typing directories instead of sliding the mouse around. But DOS gives you a fast, sensible option. If you make a PATH statement for a frequently used program, you simply type its name to activate the program instantly. It makes no difference where it is, or which directory you happen to be in at the time.

If you're buying a computer to run just two or three applications, the Mac approach is fine. For those with more ambitious plans, the utility of DOS gives IBM PCs the edge in most business uses.

But remember: the new IBMs run DOS. Don't throw anything away yet. OS/2 is an optional operating sys-

tem; wonderful in concept and looming large on the horizon, but by no means mandatory.

IBM says OS/2 will make the world a better place, and IBM may be right. DOS, which forces programs to run in 640 kilobytes (or less) of memory, is beginning to look quaint in these days of megamemory. OS/2 smashes that barrier, offering the alluring prospect of many-meg RAM memory and true multitasking (read: doing a zillion things at once).

Precious little software runs on OS/2 now, though, and it will be some time before a lot of it does. In the meantime, most PC users will be well-served by—and reluctant to abandon—their substantial investment in DOS software. There are other ways around the 640K DOS barrier. And there are other ways to run programs simultaneously. Without OS/2.

The Mac II has no such 640K restriction. But its multitasking program, MultiFinder, can't compare with OS/2 in sophistication. And MultiFinder has other problems. The current version is prone to crash under some circumstances, and most programs that work with it are rather lame running as background tasks. Even Apple's chairman, John Sculley, calls MultiFinder a "first generation" system and admits his company has a long way to go.

The true appeal of OS/2 will probably become apparent only with the eventual introduction of Presentation Manager. This may tilt the balance dramatically. Presentation Manager will offer a friendly, Mac-like graphical interface (similar to Windows, say industry insiders) and, because of OS/2's greatly expanded power, it just may be the first viable challenger to the Mac's seamless software interface.

The Mac's interface, with its consistent look and feel, makes learning any new program like checking into a Holiday Inn hotel room anywhere in the world. Everything is just where you expect it to be. No surprises. No learning curve. No lost time.

On the other hand, programs written for IBMs vary widely, which for years has made IBM users throw software manuals against walls and out windows.

This matters less today, though, because the new machines have enormous memory and immensely more powerful processors. More power means easier software—easier to learn, since there's room for help menus on virtually any topic; and easier to use, since function keys can be made to do things that once required a complex series of commands.

More than 12,000 commercial software programs are available for DOS machines. That, as much as anything, propagates the species.

But the Mac is moving up. More than 2 million have been sold and there are excellent software packages for every major category of application. Mac sales continue to climb briskly.

Something else to consider is that more and more

software is available for both machines. There is a smoke-and-mirrors aspect to this, since a DOS program cannot really be "adapted" for the Mac; another one is written and sold under the same name. Nevertheless, most are very good translations that use similar command structures and are nearly always able to use the same data files.

We might be able to infer something useful from this. Both the IBM PS/2 and the Mac II were introduced more than a year ago. If one were a hands-down winner, we might be seeing mass one-way software migration by now. As it happens, software is moving both ways. Microsoft was the first major vendor to cross the line, releasing Mac versions of *Word* and *Multiphan* (originally written for DOS) and a PC version of *Excel* (the award-winning Mac spreadsheet). Other publish-

ers have followed—including Ashton-Tate, WordPerfect Corp., and Innovative Software.

One area in which the IBM and the Mac function very differently is desktop publishing.

It's hard to be coldly objective about the comparison. For one thing, desktop publishing means different things to different people. And there are no calculations-per-second benchmarks to follow. What matters is the type of output you expect from your machine and the frequency with which you use graphics programs.

If you need clean, presentable correspondence and quarterly departmental reports that include charts and graphics, you can live quite happily with an IBM Model 80 and a laser printer.

On the other hand, if a good portion of your time is devoted to the presentation of information rather than

▶ The Motorola 68000 processor and the Intel 8086 microprocessor chips, introduced in the early 1980s, have spawned families of 16- and 32-bit processors that have enjoyed wide commercial success in the PC industry.

The good fortune of both chip families stems from the same source: they were used in computers that became popular because of what the computers could do, for the applications they could process. As everyone knows, IBM selected the Intel 8088, the 8-bit bus version of the 8086, to power the original PC and the hard-disk-equipped PC-XT that followed it. The 8086 was designed by Intel as a processor that would be upwardly compatible for applications running on the highly successful Intel 8080 chip.

That decision required, among other things, that the 8086/88's 1 megabyte of memory be segmented into 64 kilobyte segments. IBM and Intel felt that many successful programs like *VisiCalc* and *WordStar* could be easily ported from 8080-based CP/M systems to an 8086-based computer, such as the IBM PC. This was true enough, and those programs were duly ported to the PC and its Microsoft-designed PC-DOS operating system—but at a cost.

The segmented memory design forced PC-DOS applications to be forever limited to 640K of memory, regardless of advances in the memory design of otherwise upwardly compatible processors. As a result, when IBM introduced the Intel 80286-powered PC

CHIPWARS

AT in 1984, the 16MB memory space the chip is capable of addressing was totally useless.

PC-DOS applications remained stuck inside their 640K limits, and ATs could be used only as souped-up XT's. In addition, PC-DOS was designed as a single-tasking, single-user operating system—the norm at the time. The 80286 is capable of multitasking when run in its protected mode, which assures that one application won't corrupt the memory owned by another application. But that too could not be used in the PC-DOS environment.

Since the AT was introduced, there has been mounting pressure to raise the memory limit of the PC family of computers and implement a multitasking operating system. The Lotus-Intel-Microsoft Specification expanded memory has solved the memory problem to some extent, and OS/2 will solve the multitasking problem when it comes into more widespread use.

Meanwhile, the 80386 processor can solve both problems in more interesting ways because it can extend the memory environment for standard PC-DOS applications and run multiple, concurrent, virtual 8086 PC-DOS systems, thereby creating a multitasking environment. The 80386 will also operate under OS/2.

The Motorola 68000 family of processors is best known for its success in Apple Macintosh computers. The processors have also enjoyed tremendous commercial success in the multitasking, multiuser world and are often referred

to as minicomputer processors rather than microcomputer processors. Like the Intel 8086 family of processors, the 68000 family has its roots in the 8-bit world.

The 6800, however, was never as successful as the Intel 8080, so Motorola bit the bullet and decided to trash compatibility with its 8-bit roots when it designed the original 68000. As a result, the memory of those processors has never been segmented, and multitasking was a design objective from the very start, even though it didn't show up until the 68010 came on the scene.

The current state-of-the-art Motorola processor is the 32-bit multitasking 68020. As implemented in the NCR Tower computers, that chip can support up to 20 users under Unix.

The current leading-edge Intel processor is the 32-bit multitasking 80386, a chip that can operate as multiple 8086 processors with their segmented memory scheme, or as a full-blown 32-bit processor with open addressing.

Oddly enough, both the Mac II and the PS/2 Model 80 are caught betwixt and between the capabilities of these two processors. The Mac II can't multitask, at least not in any of the current versions, but the PS/2 can, although the OS/2 version doesn't take full advantage of the virtual machine capabilities of the 386.

Meanwhile, users who want to run multitasking DOS applications with their 386s have a wide array of schemes to choose from, such as Windows/386, VM/386, and PC-MOS. And the hearty among Mac and PC users can even give Unix a try.

—John Dickinson

its content—how it looks and not what it says—you're a candidate for a serious (read: expensive) desktop publishing system. That means a Macintosh. IBM could never have invented desktop publishing.

Ventura Publisher and *PC PageMaker* are solid, useful programs for IBM desktop publishing. Lots of businesses use them to crank out everything from directories to documentation. The programs "do" graphics—both creating them and incorporating them into text documents. By and large, the PC versions of the programs do it just as well, if a shade less easily, than their Mac II counterparts. And, of course, there are winks and nudges from IBM telling us that this will change very soon.

Good presentation is easier on a Macintosh. That's in part a virtue of its roots as a graphically oriented machine. The primitive forms from which pictures are drawn—square, circle, line—are built into the Mac.

Good presentation—the kind the Mac makes simple—is important to effective paper-based communications. But if your documents are being generated by data from DOS applications, think IBM.

And if your documents are destined for desktop publishing, the edge has to go to the Mac. If your previous experience with Macintosh graphics has been on a Mac Plus or even a Mac SE, you owe it to yourself to test-drive the Mac II and its full-page monitor. Screen redraw of a 300 dots-per-inch image is very quick; resized images write back to the screen in a flash; text scrolls smoothly and quickly. Charts and graphs move onto the screen almost as quickly as text.

And that's with just a stock Mac II carrying 1MB of memory. The machine's memory can be expanded to 8MB, all addressed seamlessly, without registers or special software. The extra memory gives the Mac a place to store very large screen images, further speeding screen redraw.

At a blazing 25 MHz, the IBM Model 80 could be just as fast if you added enough extra memory. But then, new 68030 add-on cards for the Mac (promised soon from several manufacturers) will up the ante to 33 MHz. Beyond this, the point may be moot; if you're going to buy a 160 mph Maserati, it's probably for reasons other than speed.

But speed is less important than other capabilities. Networking is the totem of a new age, and you can bet both Apple and IBM have worked hard to make eminently networkable machines. This is one thing you don't need to factor into a purchasing decision.

But what could be a sensible solution for many—using Macs and IBMs for different applications—is often overlooked because of vague notions that these machines are as compatible as oil and water. And we've all heard horror stories about the consequences of incompatibility. Relax.

▶ Flashing the Cash: What the Systems Cost

The PS/2 and Macintosh are still different enough to make comparing Apples and IBMs a bit like comparing apples and oranges. This is particularly true in the case of memory.

The Macintosh family, with its graphical interface, requires more memory for the operating system, but it can also use large amounts of memory.

The IBM running DOS requires less memory for the operating system, but it is unable to use large amounts of memory directly. Until OS/2 or another operating system becomes the standard, the value of extra memory comes from its use as RAM disks and caches and from software written to take advantage of Expanded Memory (EEMS).

For comparison, we assembled two high-end systems capable of running the software you would expect to use on each.

Comparable Systems

Macintosh II

Base price: \$5,598

Includes:

16 MHz CPU
1MB RAM 800K,
3 1/2-inch disk drive
40 MB hard disk
SCSI, Appletalk, and mouse ports
Math coprocessor
Extended keyboard
Mouse

Video cards: \$648

Apple color monitor: \$999

8MB memory:

4 x 2MB expansion kits
(\$849 each): \$3,396

Total: \$10,641

IBM PS/2 Model

80-386-041

Base price: \$6,995

Includes:

16 MHz CPU
1MB RAM
1.4MB, 3 1/2-inch disk drive
44 MB hard disk
Serial, parallel, mouse, and
keyboard ports
VGA video

Operating system

PC-DOS 3.3: \$120

Math coprocessor: \$795

**12-inch VGA color display,
model 8513:** \$685

**Memory expansion board
with 2MB:** \$1,695

Extra 2MB

(5MB for whole system): \$895

Total: \$11,185

There are lots of ways to hook Macs to PCs, transfer data, and convert file formats—the three essentials of making the machines work together.

Several packages include telecommunications software and the necessary hardware to connect the two machines directly—*MacLink Plus*, *Lap-Link Plus*, *PC Quickshare*, and others. And if you can't find cables long enough, use Ma Bell's. Or send files to an electronic-mail system from one machine, and retrieve them with the other.

Another solution is true networking. It's been possible for a couple of years now to put an AppleTalk card into a PC. Now, a version of Novell's *NetWare* will let Macs run on PC networks.

Finally, data can be swapped with external drives that run on either machine and read the disk format of the other. If you're still anxious, read *The MS-DOS—Mac Connection*, by Cynthia Harriman with Jack Hodgson (published by Brady Books).

In the struggle for the hearts and minds of America's users, IBM has a decided edge when it comes to the "goodies."

Though the new Mac performs a lot more tasks traditionally associated with PCs, it just can't match the vast array of PC-compatible products. Even if both machines were equally good at everything (and they're not), this alone would tilt the balance toward IBM for anyone considering a computer as a multifunction tool.

One of the joys of owning a big, important computer is making it do new things. Both the Model 80 and the Mac II are big and important. But Mac users can't enjoy the satisfaction of window shopping—and the thrill of buying and using an astonishing parade of new tools—on the same scale as PC users.

Nearly every whim of human experience has been made IBM-compatible. Fax cards, scanners, voice-mail systems, miniprocessors that emulate operating systems other than DOS—all this and more plug right in and make life easier. The choice of PC keyboards, monitors, and printers is also much broader than for the Mac.

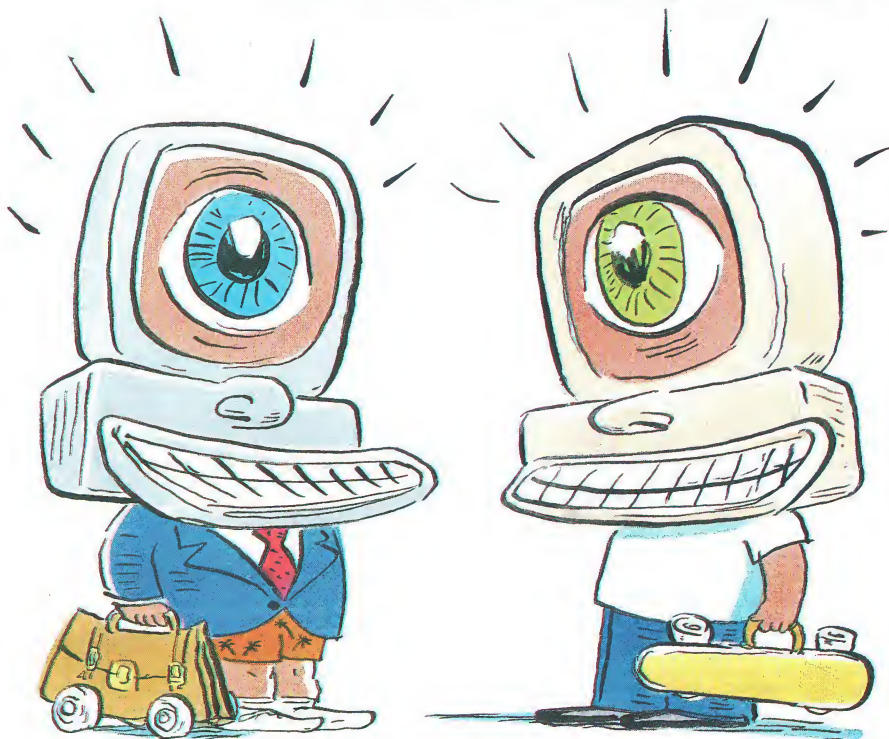
Of course, this may change as the Mac gains popularity. But for now, IBM is the clear choice for multiple applications.

Obviously, neither Apple nor IBM is an endangered

species. But it's foolish to buy anything that plugs into an electrical socket without worrying about obsolescence.

There's no sure way to tell, of course. The best measure we have is what's called the "installed base." It amounts to how many users will riot in the streets if support is suddenly cut off.

There's no question that the IBM family (PC, XT, and AT) running on the DOS operating system has an armlock on the business computing community. For all



practical purposes, this makes IBM as safe as the Federal Reserve Bank. Market researchers at Creative Strategies estimate that more than 20 million PC (and PC-compatible) machines have been sold since 1981, when IBM introduced its first PC. IBM's PS/2 machines, introduced in April, have already topped 2 million in sales.

After all is said and done, the Mac is still better with graphics, the Model 80 still better at business. But the gap in both areas has narrowed enough to make the choice between the Model 80 and the Mac II tougher than ever.

The good news is that both machines are finally powerful enough to begin performing the kind of miracles we've long thought they should. And the choice need no longer be clear-cut—if you need the strong points of both, buy both. They work well together, and they've become so much easier to use that it's no longer a make-or-break decision between learning Arabic or Chinese.

Ultimately, the trend toward togetherness will benefit us all. Mac has a lot to learn from IBM—and vice versa. Clearly, these two machines demonstrate that the lessons are being learned on both sides. ■



great looking pages

No-nonsense desktop
publishing is as simple as
choosing the right word-
processing software

By
JIM SEYMOUR

It starts innocently enough.

You see the proposal Phil prepared for the American Hydrodynamics bid. Or the set of overheads Marian used when she made the big sale to Inert Systems. Or the contract Kenneth drew up for the Owen Sound reclamation work.

They look so good.

You want your stuff to look that way, too: crisp, professional, as if it just came from the typesetter. Right off the laser printers hooked up to personal computers in those other people's offices. Laser printers and PCs just like the ones your secretary uses, in fact. Hmmm. . . .

Your secretary can't do that kind of work on the word processor she uses, of course. So you turn in a purchase order for a copy of that desktop publishing program everyone's using. It comes; she digs into the manuals. She's getting this down pretty good now . . . just look at that sample page!

So she starts using *PrettyPagePublisher* for your most important letters and those proposals, reports, and overheads.

Wow.

This is The Right Stuff. Looks fresh from the printer, with those nice 1-2-3 tables right in the text, the company logo on every page, and boxes around the important parts.

But a few weeks into this desktop publishing fervor, you begin to notice how many things are slipping. Like getting things finished and out the door. What once took an hour "to get typed" now takes a morning; what once took a morning takes a couple of days; and what once took a couple of days seems never to get finished.

This isn't desktop publishing; it's desktop entropy. You've become a junkie for the form and look of things at the expense of productivity.

And you begin to question just how important it is to have your letters printed in 12-point Times Roman on a 14-point slug with 3.6 points of leading between paragraphs, 6 extra points after the "Dear John," the addressee's company name in bold italic, and page numbers in small-cap 10-point Helvetica.

But gosh, it looks so good

You're not alone. But there's quick relief ahead.

PC-based desktop publishing has swept Corporate America, revolutionizing the production of newsletters, catalogs, price sheets, press releases, technical manuals, and the rest of what we knew all along the technology was meant to handle. No longer relegated to mundane production and PR-oriented roles, desktop publishing has moved upstairs into mainstream administrative, sales, marketing, and finance work.

The "DTP look" has caught on in a big way in business. But that look comes at a high price.

Part of the price is due to the larger and more complex PC systems required to run desktop publishing software and produce the finished work. No one does serious desktop publishing on a two-floppy, 256-kilo-byte PC connected to an IBM Graphics Printer. Entry-level platforms start with 80286-based PCs, oversized high-resolution monitors, large hard disks, and laser printers with plenty of memory for downloadable fonts.

Another part of the price is training cost and time. That includes the inevitable productivity sag that comes between learning the new method and getting really good at it.

But these costs are acceptable. Low-end PCs are on the way out in business anyway, as 286 and 386 PCs become the norm. Laser printers are commonplace in many offices. And businesspeople, by and large, accept training costs as a worthwhile investment.

What's *not* acceptable is the dirty little secret about desktop publishing systems as office tools. Using one of these systems to build a document—be it a letter, report, or proposal—takes much more time than what we're accustomed to spending on the river of paper that flows across our desks.

Aren't computers supposed to make things *faster*?

The final irony is that for the majority of business paperwork now being processed for that "DTP look," only a few desktop publishing tools are needed. We don't need easier and faster desktop publishing programs, we need more powerful word processing programs—software designed to turn out documents in a production setting while offering enough publishing features to generate those great-looking pages.

Which, it turns out, is a perfect description of the latest round of PC word processing packages.

In fact, we may not be able to call them *word processing programs* any more. There's an apparent contest among vendors for the right to name this emerging category of software. Sad to say, *word publishing* seems to be winning. Tin-eared and not a little stupid, *word publishing* may turn into the hot buzz-phrase of 1989.

Remember: You read it here first.

The main players in this new round of the word processing game are WordPerfect Corp.'s *WordPerfect*, Version 5.0; Microsoft Corp.'s *Word*, Version 4.0; Lotus Development Corp.'s *Manuscript*, Version 2.0; and Micropro International Corp.'s *WordStar Professional*, Version 5.0 and *WordStar 2000*, Release 3. A second

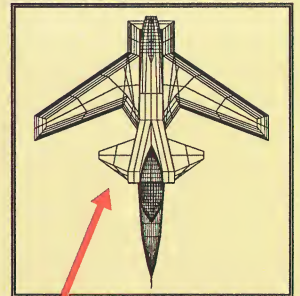
Lotus Manuscript Company Newsletter

Supersonic, Inc.

March 14, 1988

Military Contract Awarded for Supersonic AX-4's

On Tuesday, October 14, 1988, Supersonic, Inc. was awarded a military contract to produce 150 Supersonic AX-4's. Production will begin early in 1989 and continue into the spring. The AX-4 is one of Supersonic's most powerful F-18 planes. The design incorporates a new concept of wingspan construction which allow the plane to fly at high speeds, even under turbulent conditions. The contract will result in a substantial increase to Supersonic's operating profit for the year. Renewal of the contract for the year of 1990 is expected by officials, and numbers may even double. This would result in long-range operating profit increases to Supersonic, Inc. to the order of nearly three million dollars.



Company Changes Improve Yearly Financial Statistics

The contract will drastically improve Supersonic, Inc.'s yearly financial statistics, thus allowing for more funds to be allocated to research and development. Particularly, for the earth-orbiting shuttle project currently underway. Supersonic, Inc. is aiming to strengthen its position in the industry as a pioneer in the development and manufacturing of defense aircraft.

New Company Headquarters

The military contract has resulted in changes in other departments at Supersonic, Inc. Company headquarters, presently located in Harrington, Illinois, will be moved to Westchester, Virginia. The reasons for this move are to bring the company administration into closer contact with official agents responsible for supervising the contract.

All administrative, financial, and planning departments will be moving to the new location, a sprawling Victorian estate. All of the manufacturing, operations, and research and development will remain based at the Harrington, Illinois site.

Supersonic, Inc. president, William Randolph told the board of directors last night, "I believe this contract represents an excellent opportunity for Supersonic to achieve a strong position in an important market. Our success reflects the high standards our company has worked hard to maintain."



The new Supersonic, Inc. headquarters.

Supersonic, Inc.

Regional Office Distribution

Graphics imported from
AutoCAD

Variable column number
and width

May 1988 Volume 15 For Travel Association Members

TRAVEL TIMES



New Cruise Options in Mexico Announced

The Mexican Government granted rights today to offer the first cruises totally within Mexico. Only Exploration Cruise Lines will offer this exclusive cruise. All other Mexico Cruises must continue to cruise from the nearest US port of departure.

According to a cruise industry expert it appeared that the new cruise would waste half your vacation just getting there. Instead, Exploration will fly you directly to La Paz in Baja to cruise amid the wonders and wildlife of the Sea of Cortez. You can go sport fishing in famous Cabo San Lucas. Or play at glamorous. *Continued on page 12*

For Family Travel

A new catalog, "Families on the Go," features books, travel games, maps, activity packs and other items especially for travelers with children. It's from Families on the Go, 1259 El Camino Real, Menlo Park, CA 94024. To order a free copy, call 415-322-4203 or write to the company.

3 Vacations for the Price of 1

For many people, Costa Rica is best loved for its deep sea fishing and Pacific Resorts. Others fall in love with the Costa Rica of clear mountain vistas and tropical rainforests. Maybe you'll fall in love with the city of San Jose while visiting its museums resplendent with the golden glory of its former grandeur and glory. *Continued on page 4*

Currency Exchange

	\$1 US	in \$US
Australia/Dollar	1.4267	1.207
Austria/Schilling	13.018	0.0764
Belgium/Franc	38.63	0.0258
Brazil/Cruzado	46.1	0.0217
Britain/Pound	0.6315	1.5835
Canada/Dollar	1.324	0.7552
Colombia/Peso	247.83	0.004
Denmark/Kroner	7.07	0.1414
France/Franc	6.227	0.1605
Greece/Drachma	140.4	0.0071
Holland/Guilder	2.107	0.4747
Hong Kong/Dollar	7.608	0.128
Israel/Shekel	1.62	0.618
Italy/Lira	1355	0.0007
Japan/Yen	150.85	0.0066
Mexico/Peso	1408	0.0007
Norway/Krone	6.81	0.1468
Portugal/Escudo	145.15	0.0068
Spain/Peseta	126.5	0.0079
Sweden/Krona	6.505	0.1537
Switzerland/Franc	1.558	0.659



.PCX file imported from graphics program

Scanned photograph

Wide variety of type sizes and styles

Lotus Manuscript Poster

Attention all sales personnel interested in

SOFTBALL REVENGE!!

We have been issued a challenge by the folks in Manufacturing. At stake is the reputation of the sales force. In last year's game we looked impressive, but inept in a hard-fought 25-3 defeat.

This year, we are seeking retribution!

We will provide the hamburgers, chips, soft drinks and beer.

All sales personnel are encouraged to wear product tee-shirts, jackets, visors etc. to show their support.

If you are interested in playing, or would like other information, please contact Kerry Thornton.

Place: Claxton Field
Date: Sunday, June 5th
Time: 12:00 - 3:00

GET OFF THE PHONE AND GET ON THE FIELD!

Large type

Proportionally spaced type within box

Repetition of graphics motif

group of very different products for the Apple Macintosh is also emerging.

Why use a word processing program when you want a printed page that looks like it came from a desktop publishing system? For economy of means and economy of time. All these products make it easier and faster to get a "published" look than Aldus Corp.'s *PageMaker*, Xerox Corp.'s *Ventura Publisher*, or any of the other new entries in PC desktop publishing.

The most obvious reason for using a word processing program is that you still need to enter text itself. Desktop publishing packages rely on word processors; they are designed to import and place into page layouts text previously created in one or more of the standard PC word processing programs. Entering text directly in a desktop publishing program is messy at best. Indeed, until recently, even editing was a nuisance.

If you have to use a word processor to enter your text

anyway, and possibly even to format it for the desktop publishing page, why not just stick with the word processor throughout?

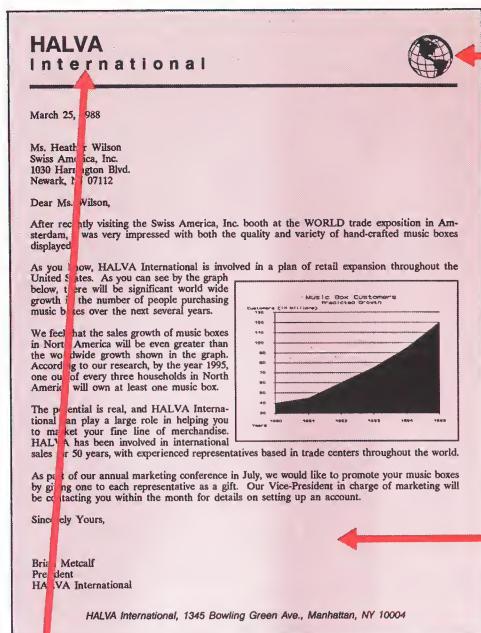
If you want relatively simple pages—say, a two-column employee newsletter with its name in large type across the top—the powerful, top-of-the-line word processing programs are more than sufficient. You don't really need a desktop publishing package.

If quick turnaround is critical, the new word processing programs are all faster than any desktop publishing package.

If the time to learn a new program is limited, the person actually doing the work will be far more comfortable far sooner with the new word processing programs than with the more capable, but intimidating, desktop publishing programs.

And finally, if you want only one or two of the simpler features offered by desktop publishing—say, large

WordPerfect 5.0 Business Letter



Letterhead created from
soft fonts and imported
graphics file

Letterhead and letter
printed simultaneously

If you have one of Hercules Computer Technology's newer Plus video boards or the Hercules InColor card with the RamFont feature, you can take advantage of *WordPerfect* 5.0's full support of those cards' ability to show font sizes, weights, and slant on-screen as you enter text and work with the document rather than as a separate, after-the-fact review process.

WordPerfect Corp. offers potential buyers of *WordPerfect* 5.0 an extra inducement—and a transparent invitation to try its desktop publishing features—in the form of a free sampler disk with 30 images from the *PicturePak* library sold by Marketing Graphics in Richmond, Virginia. *WordPerfect* will also throw in a free copy of Bitstream's \$485 Fontware Installation Kit, which customizes all Bitstream Fontware soft fonts for use with *WordPerfect*.

Until recently, the superb Bitstream fonts were available for use only with *PageMaker* and *Ventura Publisher*, the two leading PC desktop publishing packages. That Fontware typefaces can now be set up for *WordPerfect* (and *Microsoft Word*; see below) is a measure of how many users are dragging high-end word processing software into desktop publishing.

Microsoft Word zipped past the previous releases of

WordPerfect when *Word* 4.0 was shipped last fall. *Word* has, from the first fumbling Release 1.0 in November 1983, shown enormous power and versatility in formatting documents. Because it uses absolute measurements, such as inches, points, and picas, *Word* can precisely position such elements as rules, graphics, letters, and numbers, including transparent handling of mixed typefaces and sizes in a single, justified line. (*WordPerfect* 5.0 now uses absolute positioning as well.)

Moreover, *Word*'s command structure has always been remarkably typesetter-like, so it simplifies some steps—such as italicizing or resizing a single character in the middle of a line—that are awkward or very difficult to execute in other programs.

Using *Word* as a desktop publishing tool is nothing new, of course. Its easy-to-use multicolumn and vertical-spacing features; the tidiness with which it extends a single line of large headline text over two or more columns; and especially its management of downloadable fonts on Hewlett-Packard LaserJets have endeared it to users for years. Indeed, *Word*'s superb support of laser printing and professional-looking typefaces led to an early and enduring alliance between Hewlett-Packard and Microsoft.

Word is especially good at supporting a broad range of printers, but it's best at driving LaserJets. *Word* makes excellent use of the various H-P font cartridges and even better use of the H-P/Bitstream soft fonts for LaserJets. Unlike the printer drivers of most programs, those of *Word* 4.0 already "know" all about the font cartridges and soft-font packages. That makes using a font simple: just pick the text you want to change, call up a menu of fonts available in the cartridge or soft-font group chosen, and indicate the size, weight, and typeface you want.

Word's famous style sheets—master lists of very specific details on how you want every part of a document to look—are especially valuable when the program is used for desktop publishing. It's maddening to spend a long time getting a document just right, full of fine-tuned little touches, and then realize you have to begin from scratch the next time a similar document comes through.

Word style sheets make starting over unnecessary. Once the perfect set of formatting commands, or "styles," has been created, it can be written into a style sheet. When saved to disk, the sheet effectively commits all of those details to memory. The next time a document of the same type is needed, a couple of keystrokes (or mouse clicks) "attach" that style sheet to the new text and transform it into a stylistic duplicate of the original.

Of course, you can build as many style sheets as you want, so you can automate production simply by building your own library of style sheets.

In earlier versions of *Word*, learning to construct style sheets was a stumbling block for some users. But in Version 4.0, Microsoft has made this powerful feature accessible to even the most casual user through a "style by example" option. Just create a document that looks right, and then ask *Word* to build a style sheet

8 STRATEGY FORMULATION

V. Strategy Formulation

Industry Assumptions

The most important assumptions we can make are the critical success factors of the industry. We see them, in order of importance, as: price, quality, and technical support. Accordingly, Aqua's strategy will be to emphasize these points before all others. By purchasing a license to Tri-Flow's product and process technology, we assure ourselves leadership positions in price and quality. By marketing our products initially in two regions of the country, we assure ourselves superior technical support. With this strategy, Aqua will grow much faster than the industry's 25% rate.

	Growth Rate 1986 - 1988		
	1986	1987	1988
California	14.4%	19.4%	33.7%
Texas	3.0	(1.3)	9.8
Industry Average	14.7	19.7	24.9

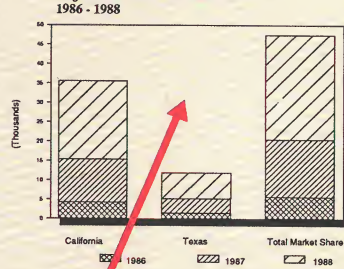
Our assumption about drip irrigation's growth is consistent with the internal predictions of Tri-Flow, and Harrison referred to earlier. We feel, therefore, they are reasonable. Driving this growth is a constant rise in surface water prices and a drop in groundwater levels at a conservative rate of 10% per year. Again, this figure is on the low side of water experts' projections.

With this dealer network and a ratio of one technical support person to each dealer, we calculated our sales figures very conservatively. For the fiscal year 1986, each dealer would sell an average of \$144,000 of our product. This is the equivalent of 500,000 feet of tubing or 1,400 acres for the fiscal year.

We plan to support our sales force and dealers with a \$45,000 advertising budget for the fiscal year. It will be spread between the trade journals *Irrigation Age* and *Irrigation Journal*, as well as local magazines targeted at growers in the southern California and west Texas regions.

Investing in a drip system can already be justified by many farmers based solely on the economics of water. Assuming an average cost of \$800 per acre for a drip system, farmers can be expected to purchase a drip system where surface water is expensive, rationed, or where

Projected Market Share



groundwater levels are so deep that pumping costs have become prohibitive. These conditions are most common in Southern California, specifically in the lower San Joaquin Valley, West Texas, and Arizona.

For fiscal year 1987, we continue to operate under very conservative assumptions. Sales are budgeted at 11,137 acres for California and 3,772 acres for Texas. Shares of the projected drip markets for the respective states are 9.4% and 6.3%. To reflect our greater market share we plan to add 2 dealers in California and 1 dealer in Texas during the year.

We see fiscal year 1988 as our breakout year. By this time our quality and technical support will be well known in the industry and our competitive situation should be strong. For the California market we have budgeted 20,249 acres to be sold through a total of 6 dealers, representing a market share of 13.7%. For the Texas market, 6,750 acres will be sold through 2 dealers, representing a market share of 9.2%.

VI. Situation Analysis

Industry Analysis

Our firm, Aqua, will be competing in the irrigation industry. Currently, the irrigation industry is a diverse one, comprising several different types of irrigation. The three primary methods are gravity method—where water is run through the furrows in the field, sprinkler method—where sprinklers spray water under high pressure, and drip method—where small emitters are placed right next to the plants. We

Though
WordPerfect and
Word are clearly
in the lead, other
packages are
contenders in the
race.

Graph and table imported
from Lotus 1-2-3

Justified column with
hairline rule

based on that document. In just a few steps, you can create a style sheet that might have taken hours using earlier methods.

Like WordPerfect Corp., Microsoft is courting new buyers. Through August 30, new buyers of Word 4.0 will get a free bundle that includes Bitstream's \$485 Fontware Installation Kit, which allows use of any of the non-H-P Bitstream soft fonts with Word (the kit is not required for the four Bitstream font packages published by H-P), plus a copy of Microsoft's Pageview, bringing some of Windows' graphical smarts to Word.

Though WordPerfect 5.0 and Word 4.0 are clearly in the lead, other high-end PC packages are contenders in

the race to deliver the power and functions of desktop publishing to word processor users.

Micropro's new Release 5.0 of WordStar Professional adds a special twist to page previewing: it reduces the size of each page and shows many at one time in "thumbnail sketches."

WordStar Professional's full-screen page previewing is especially useful. The program is unique; it shows on-screen the typefaces and sizes used. To accomplish this piece of legerdemain, it converts printer fonts to screen fonts. The screen fonts may be crude in comparison with the printed results, but they are still far better than those of any other program. WordStar Professional also blends text and graphics easily.

Micropro will soon ship a new release of a second product with desktop features, WordStar 2000. This program will do everything WordStar Professional 5.0

**WordPerfect 5.0
Business Newsletter**

Vol. 11 No. 1
HALVA International Report
January 1990

Trade Winds

Product Boosts Sales by Two Million

Record sales of the new line of music boxes has boosted first quarter revenues to the tune of 2 million dollars. It is expected that by the year 1995, one out of every 3 people in the United States and Canada will own a music box.


On the drawing boards are music box watches, dash-board models for cars, waterproof boxes for showers, ultra-light boxes for backpackers, and even an amplified music box that plays a disco version of "Que Sera Sera."

Music boxes with figurines depicting the following occupational motifs will be available in June: The Corporate Purchasing Agent, The Lottery Winner, The Graphic Designer.

Research indicates that the upsurge in purchasing music boxes stems from a trend towards the traditional. In addition, the actual music has been found to be beneficial to emotional and physical well-being by reducing stress on the nervous system.

Training Classes and Seminars

Our fourth in a series of guided imagery revivals will mentally transport everyone from Pokeney Stadium to the rain forests and beaches of Kona. (A \$5 donation is requested for the experience.) A course in telephone etiquette and actual phone operation will be offered three times a day starting on Monday. Contact Wendy at extension 345, or by dialing (800) 378-5000.



Worldwide appeal of music boxes rises.

HALVA Goes Retail

A turning point in the history of HALVA International came on January 18th at the Grand Opening of the first HALVA retail outlet in over 60 years as a mail-order house for fine jewelry.

Attending the opening were city officials, the Governor of New York, and the Prime Minister of Atlantis. Our own illustrious President was there at for the occasion, and warmly greeted all in attendance.

The reaction from customers was encouraging, with many impressed at the quality line of merchandise and competitive prices throughout the store.

By the end of this year several other retail outlets will be opened throughout major cities in USA, with plans to open over 1,000 more outlets by the end of 1996.

Inside

Editorial 2
Holidays 4
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The Swiss Connection	... 6
What's Happening in Manhattan	.. 8

Varying-width text columns wrapped around graphic

Indented text block with decimal tabs

Within a year or two, every major word processing package will offer substantial desktop publishing features.

WordPerfect, Version 5.0

List Price: \$495

Requires: 512K RAM, DOS 2.0 or later.

In Short: New features of Version 5.0 include plain English menu choices to select font and size, a vastly improved preview feature that permits full-page and "zoom-in" viewing, and superb printer support.

WordPerfect Corp.
1555 N. Technology Way
Orem, UT 84057
(801) 225-5000

Microsoft Word, Version 4.0

List Price: \$450

Requires: 320K RAM, DOS 3.1 or later, graphics adapter card.

In Short: Word features include absolute positioning of text on the screen and "style sheets" that automatically format similar documents in similar ways. A powerful new feature of Version 4.0: users need only create a document that "looks right" on the screen and Word will design a style sheet for it.

Microsoft Corp.
16011 NE 36th Way
P.O. Box 97017
Redmond, WA 98073-9717
(800) 426-9400
(206) 882-8080

Manuscript, Version 2.0

List Price: \$495

Requires: 512K RAM (640K recommended), hard disk, DOS 2.0 or later.

In Short: Manuscript, Version 2.0 features page-previewing mode, built-in macros, and integral outlining that makes moving from outline to text easy. Most of the interface problems associated with the first version have been cleared up.

Lotus Development Corp.
55 Cambridge Pkwy.
Cambridge, MA 02142
(617) 577-8500

WordStar Professional, Version 5.0

List Price: \$495

Requires: 384K, DOS 2.0 or later.

In Short: WordStar Professional blends text and graphics easily. An especially nice feature is its ability to convert printer fonts to screen fonts, allowing the program to display actual typefaces and sizes on the screen. With 512K, a graphics card, and a large monitor, you can view thumbnail sketches of up to 144 pages simultaneously.

Micropro International Corp.
33 San Pablo Ave.
San Rafael, CA 94903
(415) 499-1200

WordStar 2000, Release 3

List Price: \$495

Requires: 384K for editor; 512K for editor with graphics; 640K for add-ons; DOS 2.0 or later.

In Short: WordStar 2000 does everything that WordStar Professional does, plus it wraps text automatically around graphics.

Micropro International Corp.
33 San Pablo Ave.
San Rafael, CA 94903
(415) 499-1200

can do, plus it will be able to wrap text around graphic images automatically.

Lotus has just revamped its technical and scientific word processing program, *Manuscript*, into Version 2.0. Always a good choice for desktop publishing work, *Manuscript* is now a superb choice.

The new *Manuscript* cleans up many interface problems and obvious omissions (such as built-in macros). Its page-previewing mode, once lethargic and infuriating, is now almost spry. Superb integral outlining makes it possible to move quickly between the outline and the expanded, full-text version of a document. As sections of outlined material are moved, formatting and graphics travel with them.

In text entry mode, *Manuscript* is a barn-burner. It also makes fast jumps to any point in even the longest document, an advantage for would-be desktop publishers going through the document electronically to insert corrections and changes.

One is tempted to say that these leading-edge programs have gone beyond mere word processing. That would be foolish as well as insulting to the millions of PC users who rely on word processing every day. There's nothing "mere" about handling text in a direct and fluid manner, and these products shine at that job. That they also add value in the form of page layout is icing on the cake.

This new software is the forerunner of a new breed. Within another year or two, every major word processing package will offer substantial desktop publishing features and rich graphical interfaces.

It's remarkable how consistently the designers draw on current Macintosh programs for their models. Early next year, Microsoft will ship its long-awaited *Opus*, which stretches even the features and functions of *Word 4.0* on the Mac. WordPerfect Corp. is building *WordPerfect 6.0*; for a sneak preview, look at *WordPerfect* for the Mac. Ashton-Tate, saddled with clunky, obsolete *MultiMate* in the PC world, knows it has a winner in its sensational *Full-Write Professional* program for the Mac; watch for *Full-Write/PC* in a year or so. And Micropro is about to ship *Zeus*, a rich word processing/desktop publishing program for the Mac; look for a *Zeus*-like product to be available for PCs sometime next year.

Enhanced word processing programs will hardly dislodge the *PageMakers* and *Ventura Publishers* of the world. Full-fledged desktop publishing software is powerful, valuable, and important in too many areas to be edged aside.

But for hundreds of thousands of business users, these new industrial-strength word processors are a better value, a better choice, and a better idea for dressing business reports for success.

Without surrendering to desktop entropy. ■

Jim Seymour is editor-in-chief of PC/Computing.

mac muscle

Let's say this plainly: Apple's Macintosh is a lot better than any PC compatible for preparing documents with the "desktop publishing look" office users demand from high-end word processors.

And again: The superiority of the Mac's hardware means software developers have been drawn to the cute little devil, with the result that the best of the new "word publishing" programs run only on the Macintosh.

The whole idea of merging word processing and desktop publishing really began on the Mac with the release of *Microsoft Word*, Version 3.0, then 3.01, in the summer of 1987. Sales of *Word* slowed somewhat with the introduction of Ashton-Tate's *FullWrite Professional*. Bought in unreleasable, incomplete form from Ann Arbor Softworks, *FullWrite* was finished and shipped by Ashton-Tate in late May.

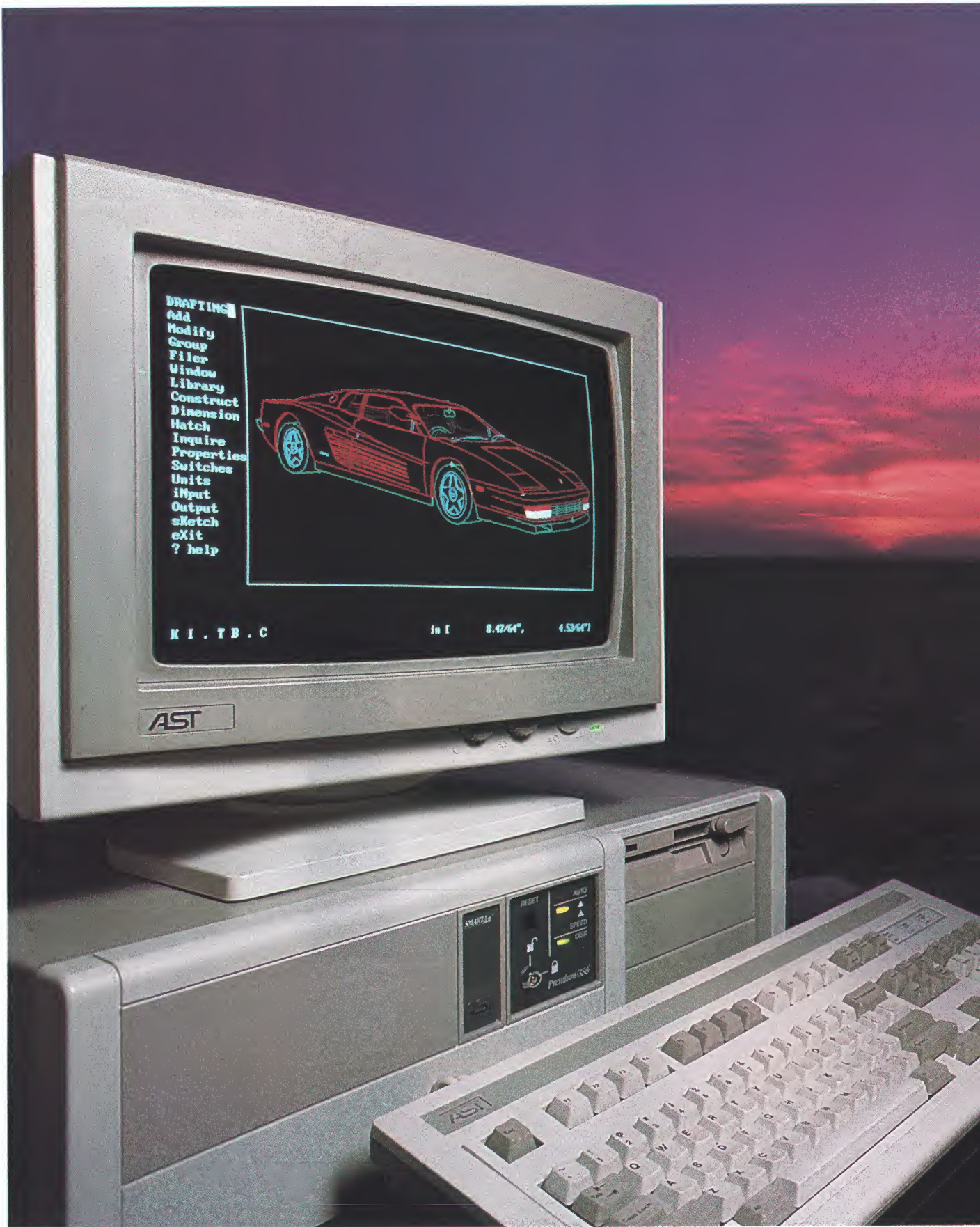
But *FullWrite* won't hold center stage for long. Micropro president Leon Williams has purchased another half-finished program, which has been code named *Zeus*, and will include sophisticated drawing tools reminiscent of Adobe Systems' *Illustrator* or Aldus Corp.'s *FreeHand*. But it remains, at its core, a highly productive word processing program. When it's released, *Zeus* will probably wear the *WordStar* nametag Micropro likes to hang on every word processor.

Microsoft can hardly sit back and watch these assaults on *Word*, its best-selling application program, so it is about to ship *Word 4.0* for the Mac. The update lets users define and add their own commands to its pull-down menus. A superior interactive previewing feature supplements the lifeless print preview feature of Versions 3.0 and 3.01. And a simply dazzling feature for building and inserting tables makes easy such tricks as word wrapping within individual columns of a chart.

Finally, Microsoft's new Quick switch feature makes its debut in *Word 4.0*. Exploiting the multitasking potential of Apple's Multifinder operating system, Quickswitch lets users bounce back and forth among *Word 4.0*, *Excel 1.5*, and *SuperPaint 2.0*, to build documents from words, numbers, and drawings.

It's hard to argue against the idea that the Mac's graphical interface and superior programs make it the tool of choice for sophisticated document production. But the focus of most buyers on PC compatibles has left the Mac a terra incognita.

What was once a cute and limited little box has grown up, especially in the form of the Macintosh II, to become a fast, powerful, sophisticated platform for word processing and the preparation of stylish documents. —J.S.



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By **EDWARD TUFTE**

Escaping the flatland of chartjunk

Described by federal prosecutors as the leader of the nation's largest crime family, John Gotti was found innocent of conspiracy and racketeering charges after a long trial. The jury had deliberated for a week, reaching no decision. They then asked to see a chart previously introduced by the defense law-

yers—a chart that totaled up the extensive criminal records of the seven prosecution witnesses against Mr. Gotti. The jury briefly contemplated the chart and then voted for acquittal on all charges. Such is the power of graphics.

The chart invites reading both horizontally and ver-

CRIMINAL ACTIVITY OF GOVERNMENT INFORMANTS

CRIME	CARDINALE	LOFARO	MALONEY	POLISI	SENATORE	FORONJY	CURRO
MURDER	X	X					
ATTEMPTED MURDER		X	X				
HEROIN POSSESSION AND SALE	X	X		X			X
COCAINE POSSESSION AND SALE	X		X	X			
MARIJUANA POSSESSION AND SALE							X
GAMBLING BUSINESS		X		X		X	
ARMED ROBBERIES	X		X	X	X		X
LOANSHARKING		X		X			
KIDNAPPING			X	X			
EXTORTION			X	X			
ASSAULT	X		X	X			X
POSSESSION OF DANGEROUS WEAPONS	X	X	X	X	X		X
PERJURY		X				X	
COUNTERFEITING					X	X	
BANK ROBBERY			X	X			
ARMED HIJACKING				X	X		
STOLEN FINANCIAL DOCUMENTS			X	X	X		
TAX EVASION				X		X	
BURGLARIES	X	X		X	X		
BRIBERY		X		X			
THEFT: AUTO, MONEY, OTHER			X	X	X	X	X
BAIL JUMPING AND ESCAPE			X	X			
INSURANCE FRAUDS					X	X	
FORGERIES				X	X		
PISTOL WHIPPING A PRIEST	X						
SEXUAL ASSAULT ON MINOR							X
RECKLESS ENDANGERMENT							X

graphics

to the multivariate world of hyperspace.



tically; neither direction enhances the reputations of those testifying against Mr. Gotti and his colleagues, as the eye detects patterns and unbroken runs of X's. Mr. Polisi, for example, has something of a streak going. The marks that indicate crimes committed by each witness are not modest or shy, and they dominate the spreadsheet grid (although only 37 percent of all possible combinations are marked). Placement of particularly obnoxious activities at the top (murder, drugs) and near the bottom of the list (pistol-whipping a priest) exploits the visual prominence of those positions.

Such displays are particularly effective and memorable in situations where most information communicated is verbal—a trial, a lecture, a business presentation. Courtroom graphics can overcome the linear, nonreversible, one-dimensional sequencing of talk talk talk, by allowing jury members to reason about an array of data at their own pace and in their own manner. Visual displays encourage different individual viewer styles and rates of understanding, editing, personalizing, and reasoning. Unlike speech, *visual displays are both a wide-band and a perceiver-controllable channel.*

Note that the display—and Mr. Gotti's fate—stands or falls on the basis of the information itself. Adding color, or other sorts of interior decoration, or even sending the graphic to the chartroom of *USA Today* would not help; indeed, boutique graphics "styling" would reduce the presentation's credibility. After all, a serious decision has to be made on the basis of the evi-

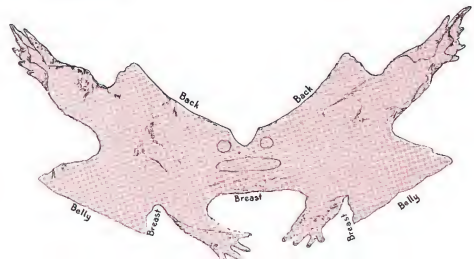
dence; the display must give full attention to evidence, not decoration. Data can only be compromised by the dreaded chartjunk. Worse, chartjunk has often come these days to replace information—just as Jonathan Swift indicted 17th-century cartographers who substituted drawings of animals for geographic knowledge:

*With savage pictures fill their gaps
And o'er unhabitable downs
Place elephants for want of towns.*

Clearing out chartjunk and turning our focus to the substance of the data brings out the deep and subtle paradox of graphics: an inevitable tension between the complexity of the world and the poverty of our methods for revealing that complexity. Even though we navigate daily through a perceptual world of three spatial dimensions and reason occasionally about still higher-dimensional arenas with mathematical ease, the world portrayed by our information displays is caught up in the two-dimensional poverty of endless flatlands of paper and screen. *Escaping this flatland is the major task of envisioning information*, for all the interesting worlds (imaginary, human, physical, biological) that we seek to understand are inevitably and happily multivariate worlds existing in hyperspace. Not flatlands.

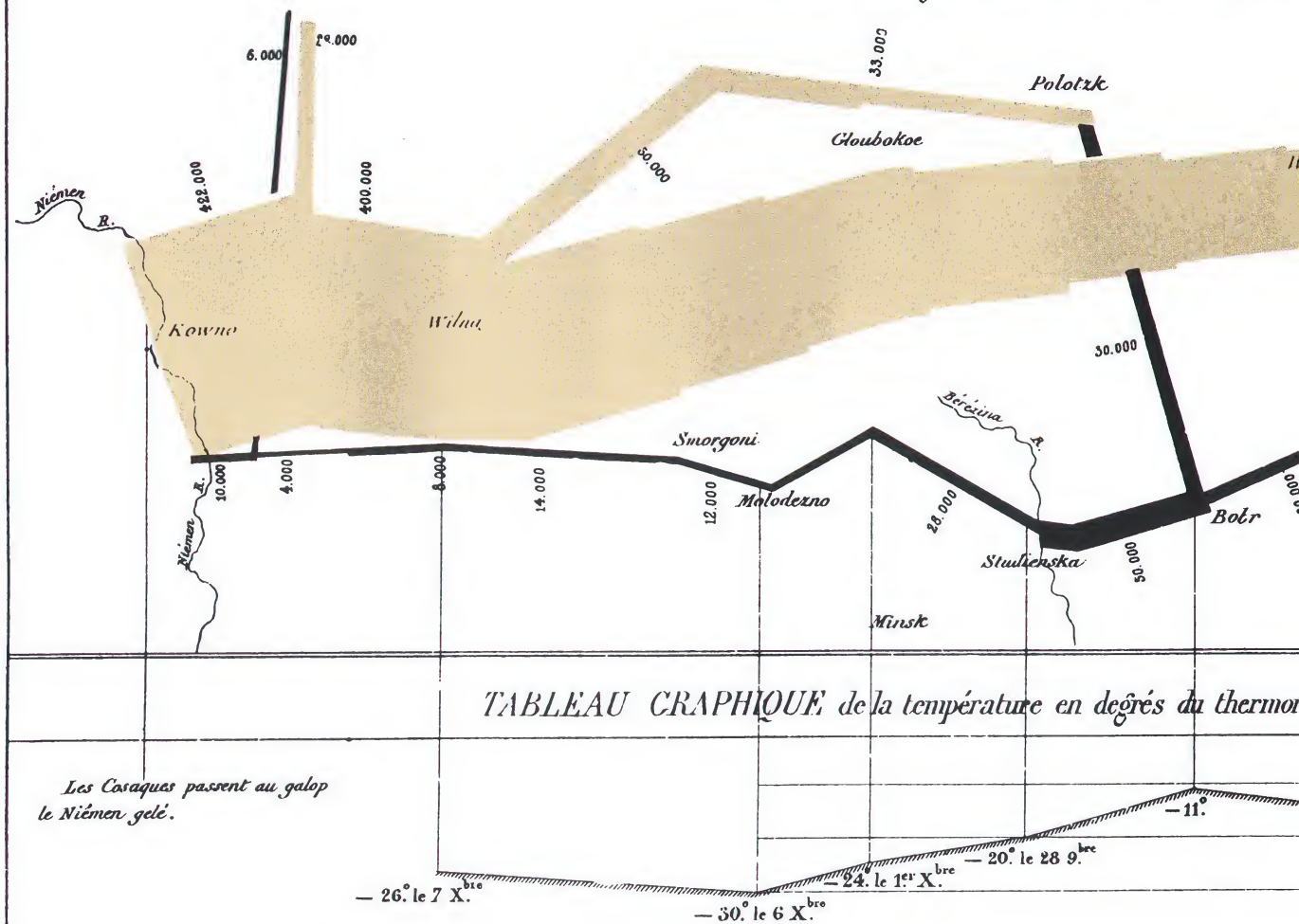
When the toad (*Bufo americanus* Le Conte) sheds its skin during a quarterly molting, the skin leaves life's spaceland and collapses into flatland, much like our information displays.

Edward Tufte wrote *The Visual Display of Quantitative Information*. His new book, *Envisioning Information*, will appear in 1989. His pieces for *PC/Computing* will examine the art and occasional science of design, showing strategies for the revelation of information.



Carte Figurative des pertes successives en hommes de l'Armée Française Dressée par M. Minard, Inspecteur Général des Ponts

Les nombres d'hommes présents sont représentés par les largeurs des zones colorées à raison d'un mètre des zones. Le rouge désigne les hommes qui entrent en Russie, le noir ceux qui en sortent. — dans les ouvrages de M. M. Thiers, de Séguir, de Fezensac, de Chambray et le journal militaire.
Pour mieux faire juger à l'œil la diminution de l'armée; j'ai supposé que les corps du Prince Jérôme en Mabilow en ont rejoint vers Orscha et Wilebsk, avaient



Autog. par Regnier, & Pas. 5^{ème} Marie 5^{ème} G^{énéral} à Paris.

All sorts of techniques for doing better than flattened-out toad suits have evolved during some 500 years of information design. Since the 15th-century Italian Renaissance, when Florentine architects perfected the necessary geometry, conventional techniques of perspective have enriched representations of physical objects.

For more abstract and richer information not snugly residing in three-space reality, several powerful techniques have evolved, often nearly silently, to be found in the workaday diagrams of those confronted with an overwhelming quantity of data. Some recently perfected statistical graphics enrich flatland with the color dy-

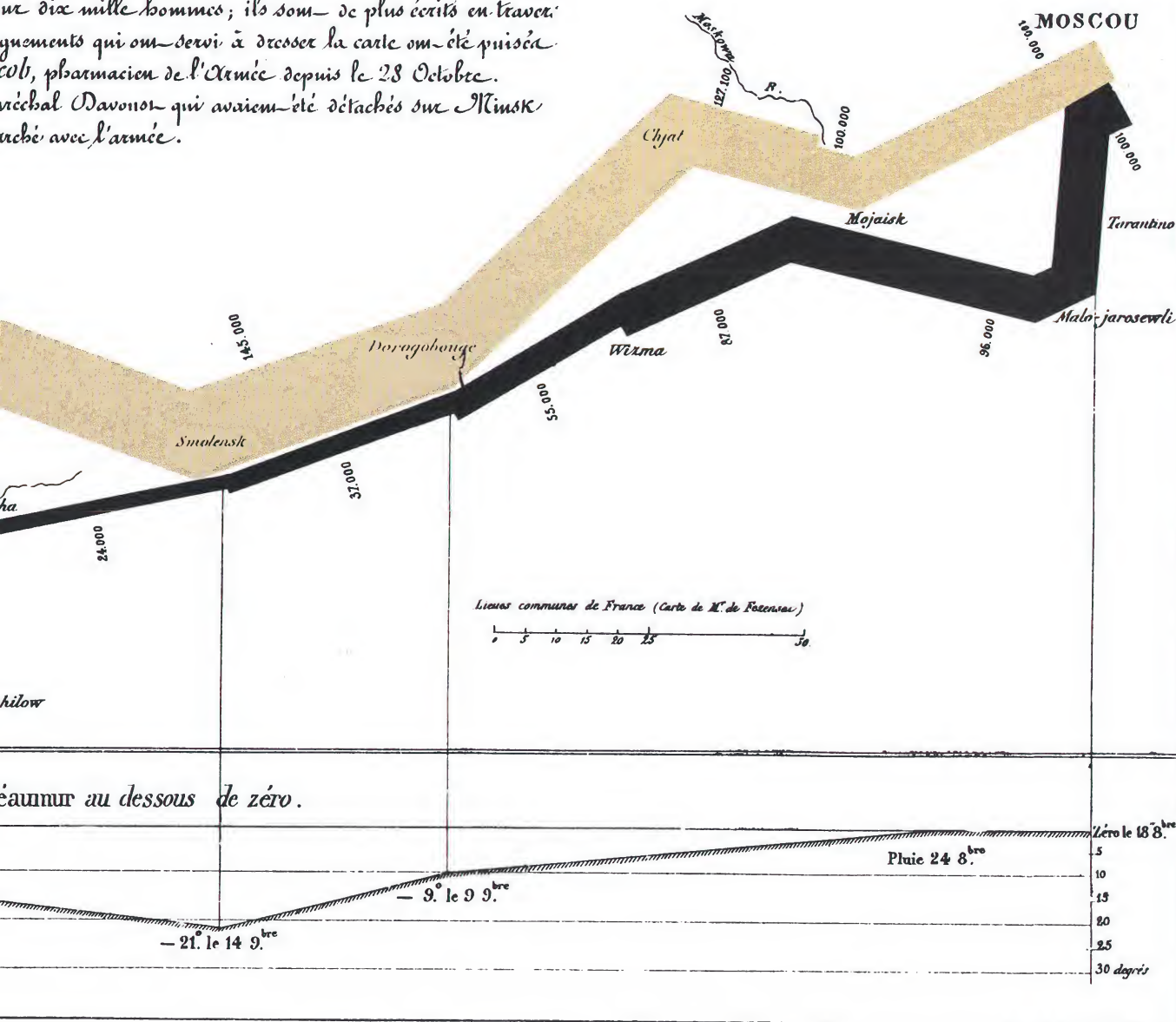
namics of rotating point clouds on a computer screen—a delight for exploring data from any point of view. From the program *MacSpin*:



The classic escape from flatland is the map of Charles Joseph Minard (1781-1870), the French engineer, depicting the tragic fate of Napoleon's army in Russia. Seeming to defy the pen of

Campagne de Russie 1812-1813.

Paris, le 20 Novembre 1869
 dix mille hommes; ils sont de plus écrits en travers
 guements qui ont servi à dresser la carte om-été puisée
 coli, pharmacien de l'Armée depuis le 28 Octobre.
 vicéchal Davonon qui avaient été détachés sur Minsk
 urché avec l'armée.



Imp. Lith. Regnier et Dourdet

the historian by its brutal eloquence, this combination of data map and time-series plot, drawn in 1861, portrays the devastating losses suffered in Napoleon's Russian campaign of 1812. This is *War and Peace* told by a visual Tolstoy. Beginning at the left, on the Polish-Russian border near the Niemen River, the thick band shows the size of the army (422,000 men) when it invaded Russia in June 1812. The width of the band indicates the size of the army at each place on the map. In September the army reached Moscow, already sacked and deserted, with only 100,000 soldiers surviving.

The path of Napoleon's retreat from Moscow is depicted by the darker, lower band, which is linked to a

This is *War and Peace*, told by a visual Tolstoy, an eloquent anti-war poster.

temperature scale at the bottom of the chart. The winter was bitterly cold, and many froze on the march out of Russia. Crossing the Berezina River was a disaster, and the army finally struggled into Poland with only 10,000 men remaining—one soldier in 42 lived.

Minard's classic tells a rich, coherent story with multivariate data. Six variables are put down onto flatland:

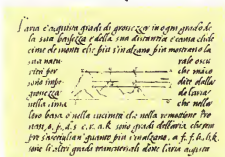
size of the army (1), its location on a two-dimensional surface (2, 3), direction of movement (4), and temperature (5) on various dates (6) during the retreat from Moscow. This may well be among the best statistical graphics ever drawn. Minard did the drawing because *he hated war*; his map was meant as an antiwar poster. Thus, like all good information design, it was driven by an unyielding commitment to the content and substance, not method or technology of display.

Minard's poster combines in a single display a map, a time-series plot, and a detailed text describing his data sources. A similar richness of informational elements is found in this narrative diagram from *The Art of Dancing*, published in 1735.



Movements are depicted on a perspective map, but in four dimensions—the flatland of floor, encoded gestures in dance notation of body motion, and time sequence. The floor plan is linked to the airy music (two additional dimensions—time and tone) by numbers, with varying steps for varying sounds. The numbers *double-function* (an important idea in the economy of visual display), simultaneously sequencing step and relating movement to music. Note the enlarged dance-floor notation for the partner on our right, since he takes a front route in switching sides. Often the redundancy of bilateral symmetry consumes space that may be better devoted to fresh information, but here the integrated complexity of dual movements, as the dancers weave and intermingle, requires symmetric repetition. This is a subtle, graceful, profoundly simple design, with straightforward intricacy, a forerunner of modern dance and movement notation.

In excellent displays such as Napoleon's march and the two dancers, the information itself pays no attention to those production or technological distinctions that segregate graphs from text from pictures from maps. It is all information, and our tools should reflect this. Albert Biderman, writing in the *Information Design Journal*, demonstrated that illustrations were once well integrated with text in scientific manuscripts, such as those of Leonardo da Vinci (shown here) and Sir Isaac



We should reject once and for all the notion that numbers are boring.

Newton, but that graphics became segregated from text and table as printing technology developed. Biderman's deep insight is not compromised by the sociological jargon:

The evolution of graphic methods as an element of the scientific enterprise has been handicapped by their adjunctive, segregated, and marginal position. The exigencies of typography that moved graphics to a segregated position in the printed work have in the past contributed to their intellectual segregation and marginality as well. There was a corresponding organizational segregation, with decisions on graphics often passing out of the hands of the original analyst and communicator into those of graphic specialists—the commercial artists and designers of graphic departments and audio-visual aids shops, for example, whose predilections and skills are usually more those of cosmeticians and merchandisers than of scientific analysts and communicators.

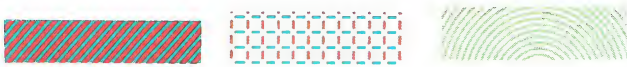
Remedies for these problems—lack of text-figure integration and segregation of the graphics department from the content department—come from the personal computer and from desktop publishing. First of all, such systems allow users to combine different informational elements, including text, graphics, and photographs; second, they bring graphics power to the desks of those who understand the content and substance of the data.

Now it is obvious (although no less important for being obvious) that we are in for a lot of awful amateur design as a consequence of computer graphics. Also, awful professional design: in “makeover” examples in desktop publishing magazines, too often “After” looks worse than “Before”!

Nonetheless, bringing the computer to design and writing is a glorious achievement, a miracle. Nearly everyone should now be writing, drawing, and printing on the computer. Probably the best evidence for making the transition is that few people have gone back to the typewriter and ruling pen once they get a competent personal computer system. And some use language rarely found outside religion to describe the impact of personal computers on their lives.

At the same time, we celebrate classic graphics work, like that of Minard, in order to learn design strategies that effectively exploit the personal computer. Traditional design skill, care, craft, good judgment, and the ability to see wisely are all the more to be valued in the face of powerful—and sometimes empowering—technology.

The major ongoing graphical damage inflicted by computers is *chartjunk*—paraphernalia routinely added to every display that passes by: overbusy grid lines, garish color unrelated to the information, tarted-up three-dimensional representations of one-dimensional data, the debris of computer plotting, vibrating optical art, and ghastly little cartoons.

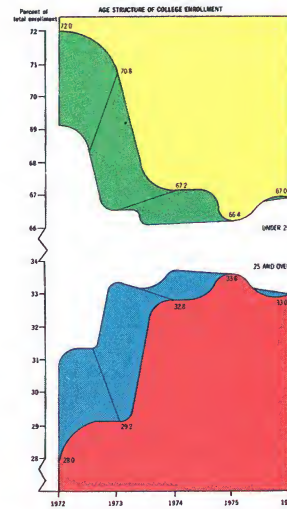


The dithered texture and pattern fills found in drawing programs generate instant chartjunk, vibrating visual activity that has nothing to do with information.

The excuse for decoration is often, “The data is boring and we need to make it come alive.” *Well, if the numbers are boring, you’ve got the wrong numbers.* Decoration won’t save the day. Note the hidden assumption here that the audience for graphics is probably somewhat thick-headed, requiring a visual trick to induce them to look at some numbers. We should reject once and for all the quality-corrupting doctrines that numbers are boring and that graphics are for those with short attention spans. These doctrines blame the victims (the data and the audience) rather than the perpetrators. Finally, garish but data-starved graphics reduce the credibility of presentations, for most audiences will have a natural suspicion of hyped graphics. Who would trust a chart that looks like a video game?

Chartjunk does not achieve the goals of its propagators. The overwhelming fact of data graphics is that they stand or fall on their content, gracefully displayed. Graphics do not become masterpieces or even attractive or interesting by the addition of ornamental hatching and false perspective to a few bars. Chartjunk can turn bores into disasters, but it can never rescue a thin data set. The best designs (as for Napoleon in Russia) are intriguing and curiosity-provoking, drawing the viewer into the wonder of the information, sometimes by narrative power, sometimes by immense detail, and sometimes by elegant presentation of simple but interesting data. But no information, no sense of discovery, no wonder, no substance is ever generated by chartjunk.

When a graphic is taken over by color-fill patterns, when all the data becomes Design Elements, when it is all style and no information, then that graphic may be called a *duck* in honor of the famous duck-shaped



roadside stand, The Big Duck (following the critique of architectural theorists Robert Venturi, Denise Scott Brown, and Steven Izenour). For this building, the whole structure is itself decoration, just as in the duck data graphic.


Many ducks grow from the addition of a fake perspective to data. This variety of chartjunk, now in high fashion, abounds in corporate annual reports, mass media, and muddled academic research. A series of exquisitely weird three-dimensional displays appearing in the magazine *American Education* delighted connoisseurs of the graphically preposterous for many years. Here five colors report, almost by happenstance, only five pieces of data (since the division within each year adds up to 100 percent). Note the subtle error in perspective construction as the top mountain fails to flop properly onto the bottom mountain. It may well be the worst data graphic ever to find its way into print.

Still, this is a highly competitive field, and worse ducks may be lurking on hard disks even now.


Such ducks are false escapes from flatland, adding pretend dimensions to impoverished data sets. They don’t work, just as this royal dining table, caught up in flatland, fails to hold the pots and plates. The king and queen watch in exasperation and exclaim, as their meal slides off, “It’s the way they draw these wretched tables!”



WORD perfect's latest: RELEASE 5.0



**If power corrupts,
you'd better get back . . .
way back.**



By PATRICK BEDARD

Near as I can tell, computer users come in two personality types. One type sees the C: prompt glowing on his screen and regards it as an invitation to personal adventure—"Let's see what this baby'll do." The other just wants to get his work done. Put me in the latter category.

Before you turn the page in disgust (computer magazine readers tend to be adventurers), let me say that I'd give up shoes before relinquishing my three computers. I'm a writer and consultant. It's a one-man shop, normally open seven days a week. Word processing put me in business, gave me the turbocharged typewriter. Producing articles, ads, letters, proposals, and reports quickly—and to a high standard of appearance—keeps me in business. Not to put too fine a point on it, word processing changed my life.

Notice that religious zeal? Word processing is a full-blown miracle, I reckon, and miracles rightly elicit blind faith. Did you ever hear of a writer who didn't believe his word processing program was not just the best one, but the *only* one?

Religious conviction is one thing; business is another. The full-time writer sitting in this chair has only one question: Do I have the best word processor for my business?

Gosh, maybe not, because I'm not a *WordPerfect* user. Consider the evidence. *WordPerfect* has become the industry leader, with sales amounting to 45 percent of the market. Its list of registered users runs to 1,070,000 names for DOS machines alone (and it is now available for the Mac, Amiga, Atari, Unix, and perhaps others). Can that many believers be wrong?

The Last Word(Perfect)

Moreover, while leading the industry with Version 4.2 (which remains on the market), WordPerfect Corp. has introduced an even better idea. *WordPerfect*, Version 5.0, edges into the realm of desktop publishing with its ability to produce text in newspaper-style columns, integrate text and graphics, draw rules, shuffle fonts in the same line without

losing track of margins, and, finally, fast-feed all of these creations to almost any laser printer you can name.

The 5.0 name for the new program has no technical basis. It's just WordPerfect Corp.'s way of telling us how much capability has been added. This may very well be the most capable of all word processors. Can any full-time writer afford to ignore it?

Lately, I've been thinking that my software is lagging behind my business. My reports and proposals are circulating into more offices these days, offices I can't visit personally. Those documents have become paper surrogates for me, and anything that makes them more readable—and, let's face it, more impressive—will ring my cash register. Layout flexibility and easy access to fonts aren't options anymore.

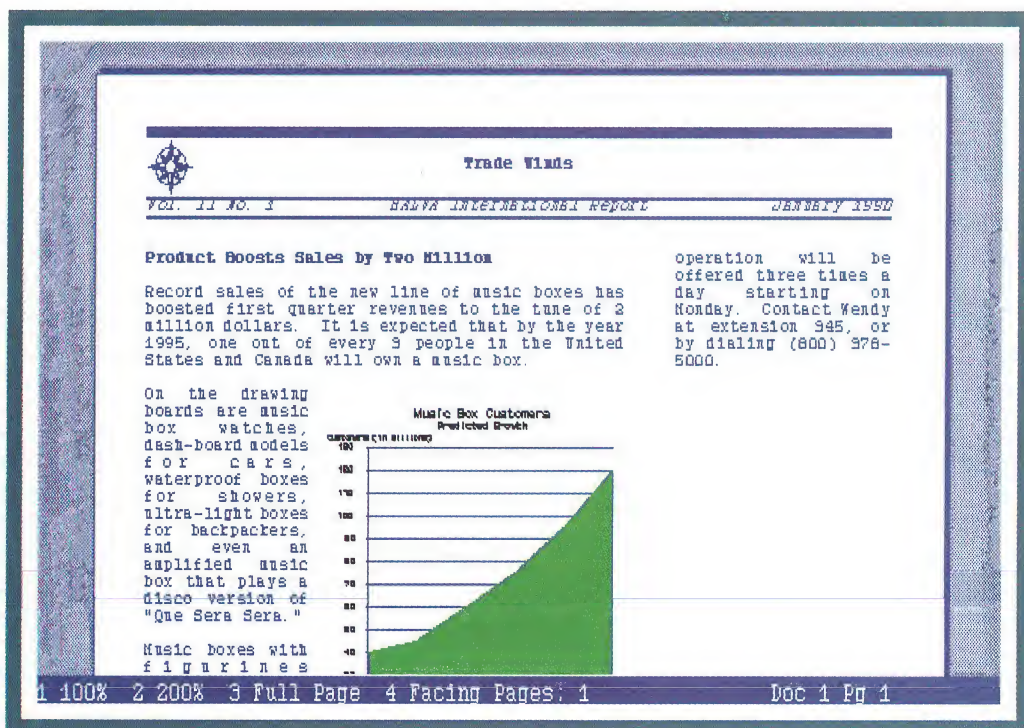
They are absolute must-haves.

So I'm definitely a sales prospect for *WordPerfect* 5.0, even if I have reservations about its one-size-fits-all-needs approach to word processing. What you get is a whopper of a program: 384 kilobytes of free RAM is required (Version 4.2 needs 205K). The 5¼-inch disk set arrives on 12 floppies. You also get a comprehensive manual (there are more than 500 pages when you count "corrections" and the index), a 400-page workbook, a Quick Reference guide to keystrokes, and handy keyboard templates.

If you're drawn to *WordPerfect* for the productivity gain 5.0 promises, your first meeting with all this paraphernalia will summon grave doubts. The Quick Reference list of keystrokes runs to five columns of relatively fine print. The templates use color coding and still finer print to call out four tasks for each function key, depending on whether it's used alone or in combination with Shift, Ctrl, or Alt (according to

WordPerfect Corp., 85 percent of 5.0's function-key combinations are carried over from 4.2). Eleven more non-function-key combinations are grouped off in the template margins.

I lost patience with the Quick



Reference list almost immediately, because directions for the two editing tasks a writer does most—driving the cursor around the page and deleting stuff—are detailed on opposite sides of the stiff-paper page. I had to keep turning it over.

It didn't help, either, that the learning disk wouldn't load and the operating disk couldn't find its own help file (as those bumper stickers say, "—it Happens").

The documentation fosters the illusion that you can run 5.0 on a dual-drive system, but you can't—at least, not up to its potential. In the 12-disk set, the main program is on two disks, and the Speller, Thesaurus, and Fonts/Graphics reside on separate floppies. To use this program without a hard drive, your hands would be a blur of juggling disks.

Farewell to Typewriter-Alikes

WordPerfect is a practitioner of the clean-screen approach. It boots up

WordPerfect 5.0 allows text and graphics to be previewed with type sizes and fonts. As many as 12 different character styles can be mixed within a document. An entire page or facing pages may be displayed or the user can zoom in on sections of a page, as shown in this example of a newsletter.

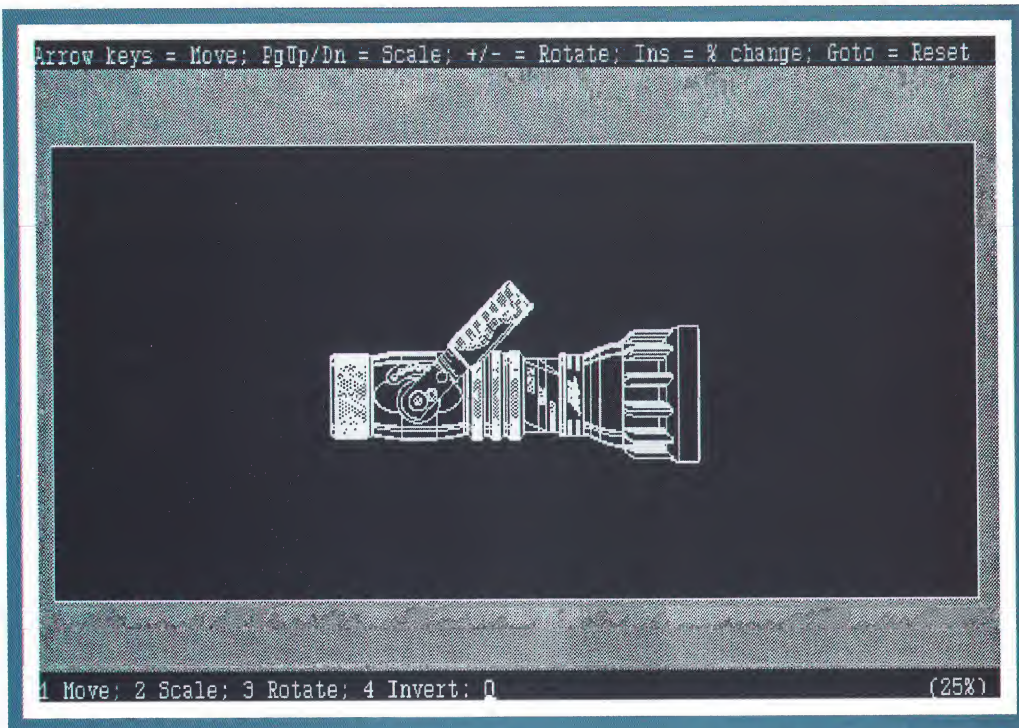
wordperfect

to a clean screen; nothing appears but a status line in the lower right-hand side of the screen. A newcomer without templates and manuals cannot make it do anything. The payoff for this austerity comes later. Once you know the moves, you will

think. Writing assignments are usually specified in terms of the number of words in the article, or as x lines at y characters. Although the Speller can count words, an on-screen tally of lines is far handier. It's like a navigational aid, always showing me how far along I am in a text. Although 5.0 has a line-numbering feature, the numbers are suppressed on screen; they appear only in print.

The requirements of the wordsmith differ greatly from those of the typist, or the executive secretary, or the word processor. While the others simply plow through documents, going back only to correct typos, the wordsmith constantly reviews, sculpts, refines. This process is intrinsic to the craft, and it requires sharp, quick, and accurate editing tools.

In this writer's opinion, 5.0 is not a perfect tool. Driving the cursor



Complex images may be imported into a WordPerfect document and scaled, moved or rotated (above, opposite, and following page).

I'm completely blown away by pre-viewing. I think that a small-scale page revealing itself in true proportion is just about as magic as word processing itself.

spend less time going through the menus.

Version 5.0 breaks away from the typewriter analogy. When you boot up the program, the page dimensions are set in inches; you can easily change the measure to centimeters or points, or even finer increments as small as 1/100 of an inch if you wish. Although you have the option of setting margins in terms of what *WordPerfect* calls "units"—the equivalent of a "space" in Version 4.2—5.0 clearly favors an approach that's more attuned to page layouts than character counts. Measuring margins in terms of inches (or centimeters or points) is a big help when you're mixing fonts of different sizes on the same line, since the margins won't vary even if the type sizes do.

Typewriter-Think

On the other hand, this layout bias is a constant annoyance for a journalist because the editorial world still operates on typewriter-

around the screen is a laborious process: one word at a time is Ctrl-arrow, a two-handed operation, and many other moves require two strokes of the same hand, starting with the Home key. Scrolling is a nuisance too, because PgDn takes the cursor to the next document page rather than the next screen.

I find that a great deal of time is wasted recovering from moves the program makes that I didn't intend. Say, for example, that I want to delete the last word on a line and the cursor is somewhere near the left margin. One stroke of the End key neatly delivers the cursor to the right end of the line, but if the line is short because of some quirk of the word wrap—and there are many such quirks caused by editing—then the End key brings up a word from the next line. That means extra keystrokes to back up a word. Sure, this isn't exactly heavy lifting, but these things matter to a writer.

Not every task is unwieldy. Putting text in bold or underline mode

is easy enough, and printing a file takes only two keystrokes. The delete sequences are efficient, and the undelete feature is genuinely useful, particularly when you're making newcomer mistakes on the keyboard.

Still, I can't help thinking 5.0 is jam-packed with features—12 pages' worth in the index—that are often just neat tricks looking for an application. Flexibility is a virtue, I suppose, but it has a price: you have to wade through all those extras every time you have a simple question.

Example: Because I'm still a "typewriter thinker," I started a document with the wrong margins. Midway through, I tried to reformat. No way. I found a nice lesson on setting different margins for the part of the document I hadn't written—another nifty 5.0 feature—but no clue about how to change what was already on the screen. Out in the corporate world, where keystrokeers are paid by the hour, it's no big deal, just part of the overhead. But in a one-man shop, when the big hand nears an hour of downtime because the word machine won't do what needs to be done, the Roloids rate goes into the red zone.

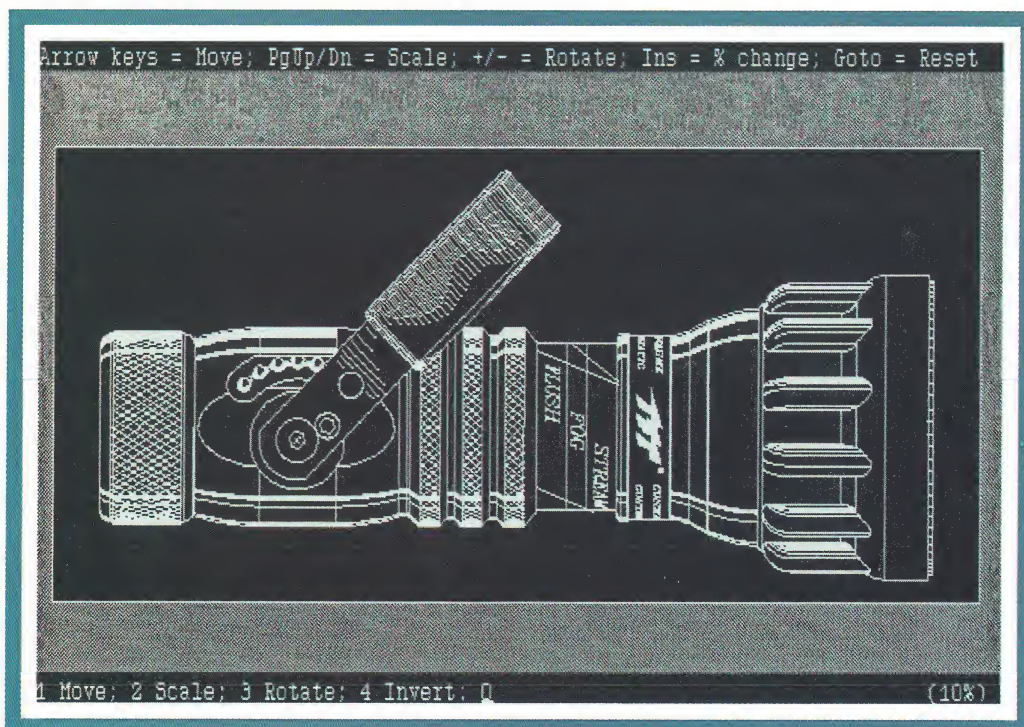
Already I hear the cries of the *WordPerfect* faithful: "You idiot! I can do that."

Brand devotees invariably respond this way about their favorite software, but their abilities never save *my* time. I called *WordPerfect*'s toll-free technical support line. Of course it was busy. Again and again it was busy. Finally, I found the solution myself. It requires deleting a set of codes from the screen—codes that are invisible unless you go through some fairly obscure steps to reveal them.

Ha! Now I can reset margins too. And, like devotees everywhere, I feel smug as a cherry orchard ca-

nary about my expertise. But having arrived at this position through my own intelligence, it's all the more obvious why companies that use *WordPerfect* have classes for users.

Version 5.0 becomes far more attractive if you stop thinking of it as



a word processor and approach it as a system for generating impressive-looking documents. You can use fonts resident in your printer, which are treated as base fonts, or you can use downloadable fonts (and graphics). You can get up to speed fairly quickly using base fonts.

Formatting's Fancy Footwork

First, you have to specify what printer you're using and which, if any, special cartridges. For example, my original-model Hewlett-Packard LaserJet has the B cartridge, which gives Courier 12 point; Helvetica 14.4; Times Roman 10 in normal, bold, and italic; and Times Roman 8. These fonts are available at any time simply by chasing through a few menus.

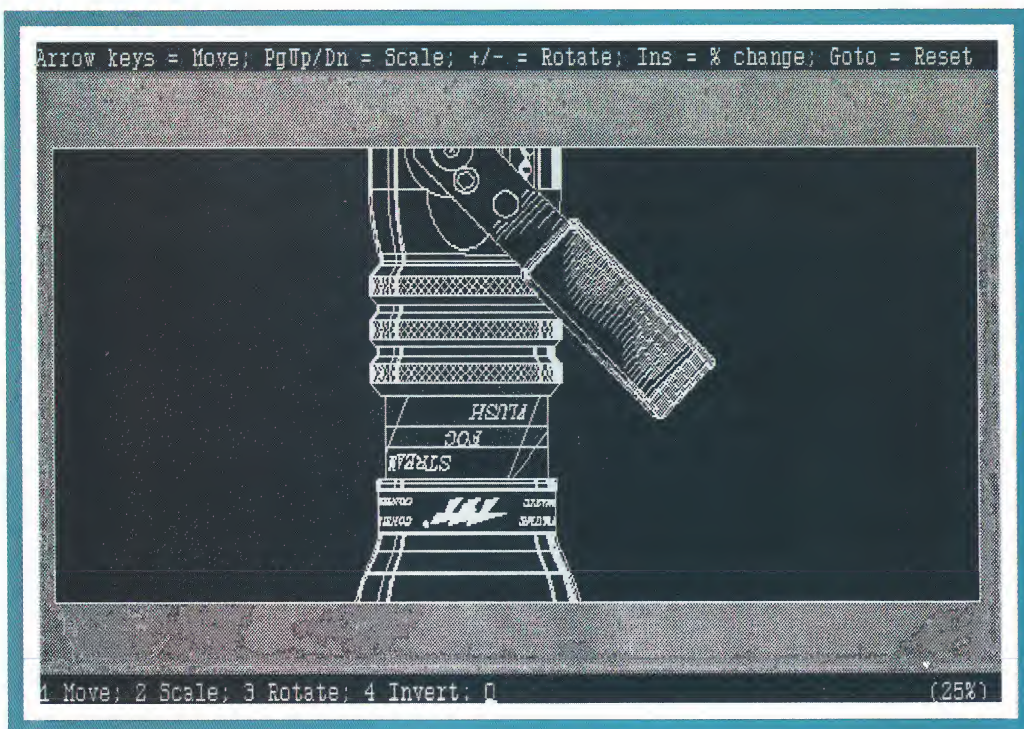
Another menu enables certain text formatting features—such as size, shadow, or double underline—depending on your printer's capabilities. The use of these features is somewhat tricky, again because you have to keep sneaking the cursor

wordperfect

past invisible codes.

The principles of good design demand that font changes and enhancements be used sparingly, but 5.0 will do a splendid execution of a grotesque design if that's what you want. I composed a few paragraphs

the miniaturized preview pages even though they're suppressed on the full-size document screen. But, truth to tell, I think that a small-scale page revealing itself in true proportion is just about as magic as word processing itself.



To my mind, what we should all be after is software that does exactly what we need and nothing more.

WordPerfect, Version 5.0

List Price: \$495

Requires: 512K RAM, DOS 2.0 or later.

In Short: The most recent upgrade of the popular *WordPerfect* 4.2 word processing program, *WordPerfect* 5.0 incorporates sophisticated formatting features such as graphics, predefined type styles, and kerning. A keyboard layout feature enables users to redefine any key or key combination to suit their needs. Users of 4.2 will have to relearn column, copy, move, and printing commands, which have changed from the earlier version.

WordPerfect Corp.
1555 N. Technology Way
Orem, UT 84057
(801) 225-5000

with random font changes, including jumps from 8-point to 14.4-point characters in the same line. In every case, the various sizes appeared on the printed page neatly aligned at the baseline, the line spacing was microadjusted for proper headroom between the tops of the tallest characters and the line above, and the word wrap automatically filled—but didn't overfill—the lines.

Before you print, you can check out your creation by selecting the View Document option on the print menu. It shrinks the page, or facing pages, to a size small enough to fit on one screen. You can also zoom in for 100- or 200-percent enlargements of any section, although character forms are not accurate in close-up views. I'm completely blown away by this trick. I rationalize my enthusiasm by saying that previewing saves emptying the wastebasket so often, and it's quite useful even for basics like headers and footers because they appear on

Less Is More

But before making a both-hands grab for more word processing "power," all of us should think back to that high school mathematics chapter on permutations and combinations. Remember that the PC keyboard has ten function keys. If the software does only ten jobs, there'll be a key for each job—that's easy enough to remember—and no finger ballet to execute them. Adding ten more jobs will use up all the Shift-function key combinations. Likewise, the third ten will use up all Ctrl-function key combinations, and

the fourth will use up the Alt-function key pairs. The more tasks you add, the more the mind chokes and the fingers dance. Thus, basic math says that simple jobs will become brain-strainingly complex on ever more "powerful" software.

To my mind, what we should all be after instead is software that does exactly what we need and nothing more, because that would be the easiest and fastest tool. Proper desktop publishing tools are available to those who need them. The rest of us just want our stuff to read right. Less really is more. . . right up to the point at which it won't cover your needs. Then and only then is less not enough.

Luck was with me four years ago when I was hunting for my first software. A friend had just completed an internal study for Time Inc. that evaluated all available word processors for potential company use. Very important, this man was a writer and editor, so he understood the application. He told me, "There

are only two programs you need to know about. *XyWrite* is the best. *PFS:Write* is the easiest, but it also does everything you need."

He was absolutely right about *PFS:Write*. I picked up the gist of it while writing a thousand-word piece for *Esquire*, and we've been partners ever since. As software goes it's an antique—introduced in 1983. But I've modernized, all the way up to Version C (copyright 1985). The computer boffins allow that, yeah, *PFS:Write* was a benchmark in its time, but they disdain it now like training wheels on a

bicycle.

But I'm not a computer boffin. I'm a writer, and a writer's job is exactly the same now as it was in 1983. We compose, we edit, we save, we print—and *PFS:Write* is lean and elegant for those tasks. Even tricks such as Search and Append commands are activated with one stroke of a function key. I've never used the Ctrl and Alt keys. They don't do anything.

The boffins are right about *PFS:Write* being an antique. It's crude in its handling of fonts in laser printers, for example. But print-

ing is a secondary consideration. Writers are, first and always, language surgeons. I wrote a book last year. It came to life just like this sentence—one word at a time. For the painstaking work of crafting thought on a page, *PFS:Write* is a scalpel, quick and sharp. Upgrading to a machete is the wrong idea, even though the tool is clearly more powerful. ■

Patrick Bedard, editor-at-large for Car & Driver, is an advertising/marketing consultant and author of Expert Driver.

▶ the hidden power

Upgrading to *WordPerfect* 5.0 is like having a two-year-old at home: each day you discover something new and wonderful. With 5.0, if you need to spiff up documents, you can incorporate graphics—and then change their size, rotation, shading, or scaling. The text will not overwrite your new graphic—that is, not unless you want it to.

Consistency is key to good-looking documents. With 5.0's Style feature, you can give a quotation a special margin and type size in one fell swoop. If you'd rather have headings in Times 20 point than Helvetica 24 point—no problem. Change the style once, and all headings are automatically adjusted.

My first laser-printed document looked odd. The problem was "kerning," the letter spacing that makes a "ti" take up less space than a "wh" in typeset documents. The solution was simple: I turned the kerning on. Wandering through menus to find this option was a small price to pay.

With *WordPerfect* 4.2, a document that looks attractive using one printer might

look just awful with another. Through a new feature called "intelligent printing," 5.0 will do its best to find comparable type sizes and styles based on the new printer's capabilities if an exact match is not available.

Academics and novelists (would-be and otherwise) will appreciate being able to link chapters in separate files into a master document. You can automatically generate a table of contents, index, and consecutively numbered pages for the entire manuscript without creating a file of unwieldy size. Lawyers and writers will like the ability to compare a document on-disk with the one being edited; 5.0 flags insertions, deletions, and other changes that have been made from one version of the document to the next.

Word Search is just one instance of 5.0's hidden power. The past several versions of *WordPerfect* let you search by directory for all the files containing a certain word. This feature was a life saver when you forgot the name of an important file but not its contents. With 5.0, you can search all documents for a word, or you can

narrow the field to just summaries, first pages, or documents created between particular dates. Another nicety: you can now move as well as copy a group of marked files.

Grumble, grumble... why can't *WordPerfect* put its help on the F1 key and its cancel on the Esc key like a normal program? The new Keyboard Layout feature lets you decide what effect any key or key combination will have. You can even define and change between several alternate keyboards. To get you started, 5.0 ships with three defined layouts. Use Keyboard Layout to create macro libraries; as a bonus you can easily display a list of descriptions for the new keys.

There is a price to pay for all these neat tricks, however—and I don't mean the \$60 upgrade charge. The learning curve from 4.2 to 5.0 goes beyond just mastering new features. Although most of the basic editing functions remain the same, 4.2 users will have to relearn column, copy, and move commands. The new keystroke sequences make more sense than the ones in Version 4.2, but still they are

different.

WordPerfect 5.0's printing features offer the most dramatic new capability, but they also require the biggest change in mindset for 4.2 users. Commands assigned to 4.2's three printing format keys (and a few new ones) all appear under *one* key in 5.0. Changing to a nonstandard page size (such as a label) can be quite tricky the first time around.

There are several other minor changes. *WordPerfect* 5.0 issues a warning before you retrieve a file into the middle of a document on-screen, and it provides the option of making menu choices via letters as well as by numbers.

If you are not tempted by *WordPerfect* 5.0, staying with 4.2 is not a crime. If you do choose to upgrade, don't try to learn everything about 5.0 at once. Installing the program and getting it to work with the printer takes some figuring out, but the basics will soon feel familiar. Some day, when you sigh, "I wish I could do that," you will not wish in vain.

—*Judy Housman is a Cambridge-based microcomputer trainer and consultant.*

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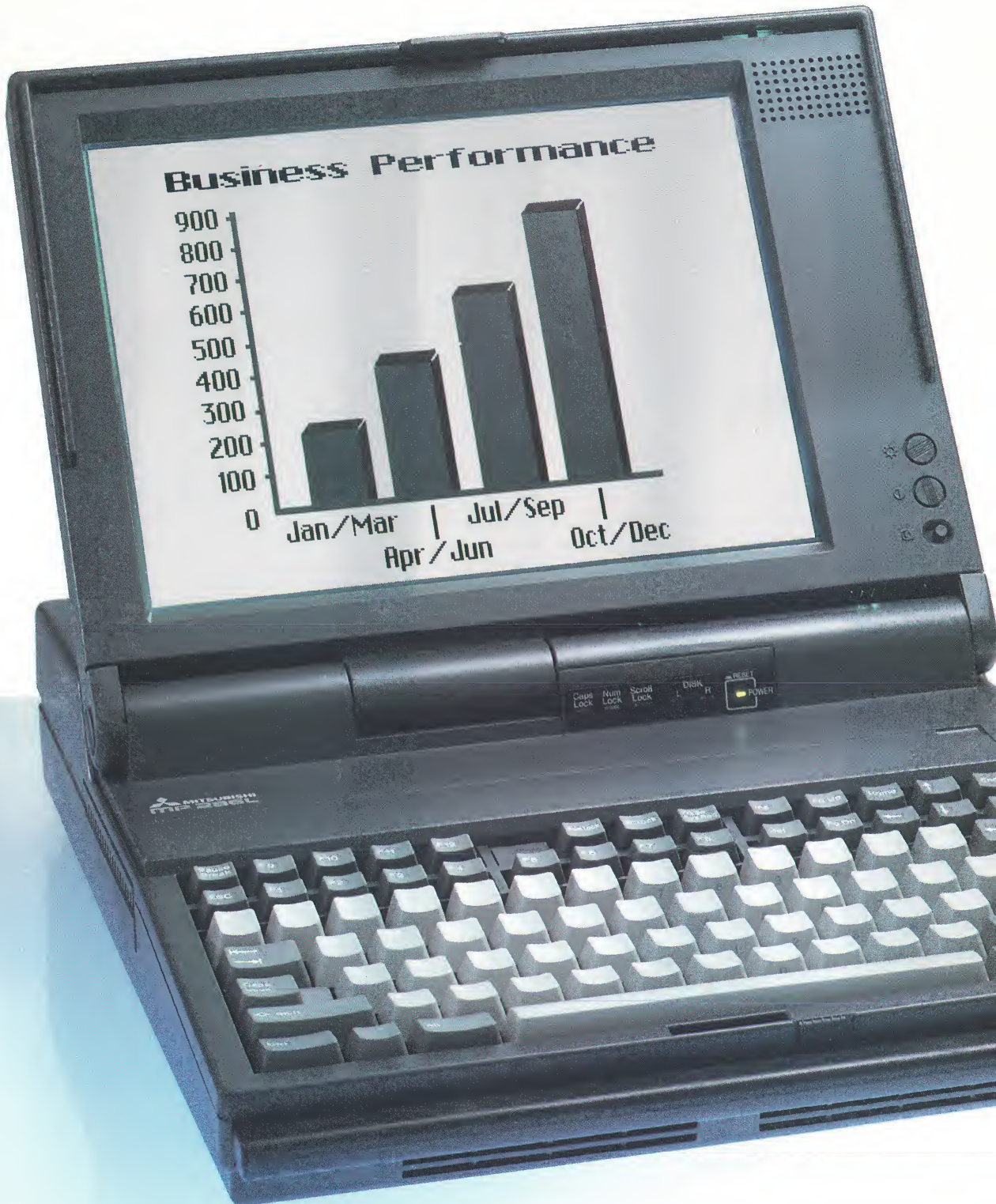
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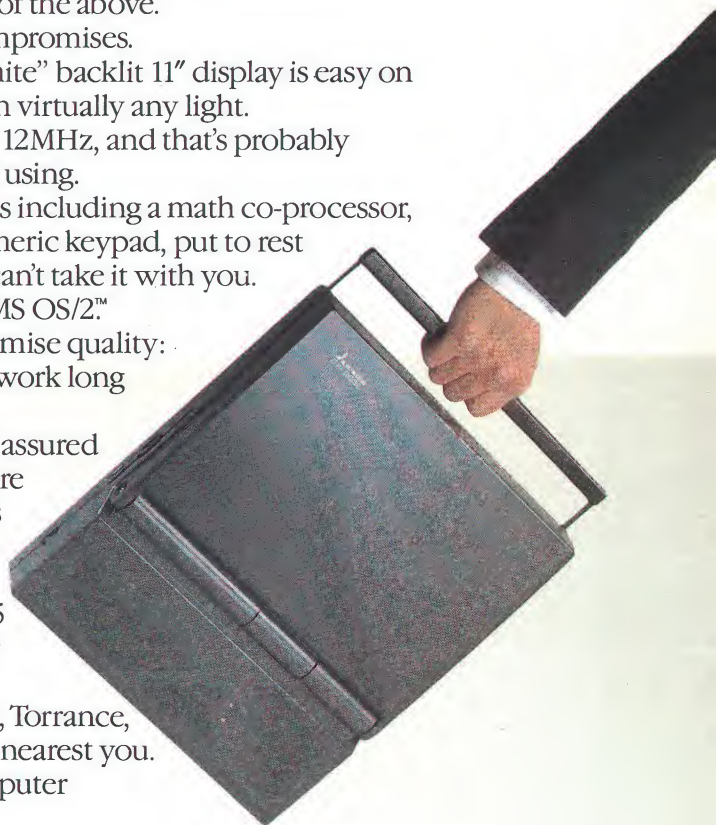
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Because the best choice in a laptop computer is right here in black and white.



laptop odyssey

In a single working weekend, our man in Patagonia travels from quill pens all the way to the late twentieth century

By PAUL THEROUX

There are probably better places to write an article than at the end of a dock in Tahiti, on a blue lagoon with two topless women lying a few feet away, basting slowly, like ducklings, in coconut oil, the only sounds their sighs as they stretch to change position; and a mile out the waves dumping their whiteness onto the reef while the island of Mooréa slumbers darkly on the horizon; and the air scented with the perfume of Polynesian flowers; and that other pungency, the aroma of tanning oil heated by the sun on a woman's skin.

There are probably better places to write, but I can't think of any.

I recently had such an experience, scribbling softly into a notebook, looking up from time to time and smiling at my good fortune.

The trouble was, my pen kept slipping through my damp, overeager fingers. I had almost everything I wanted. The one thing I lacked was a laptop computer—an object I had glimpsed in the hands of John Travolta in the movie *Perfect* and have coveted ever since. A laptop is the machine that has propelled the pen and notebook into obsolescence, and much more than that, has mingled memory and desire, crunched numbers, sorted out one's very existence—and the damn thing draws pictures, too. Even in the somnolent South Pacific, such a contraption would turn anyone's head.

I had resisted advanced technology in writing because I enjoyed the physical sensations associated with scribbling: the satisfactions of calligraphy, the smell of ink, the rubber shreds of an eraser, the textures of paper. All such sensations are lost to the person at a computer.

But other alternatives materialized when *PC/Computing* asked me to try various laptop computers: the Toshiba America T1000, NEC Home Electronics MultiSpeed HD, and the Zenith TurbosPort 386.

I had never used a computer, never owned a word processor, and most of the lingo of computing was unknown to me. When I thought of the criteria by which I would test a laptop, my mind went back to the sun-drenched wooden dock in Papeete, and I wondered what use these laptops would be in that situation. The answer was: very useful indeed, but to varying degrees.

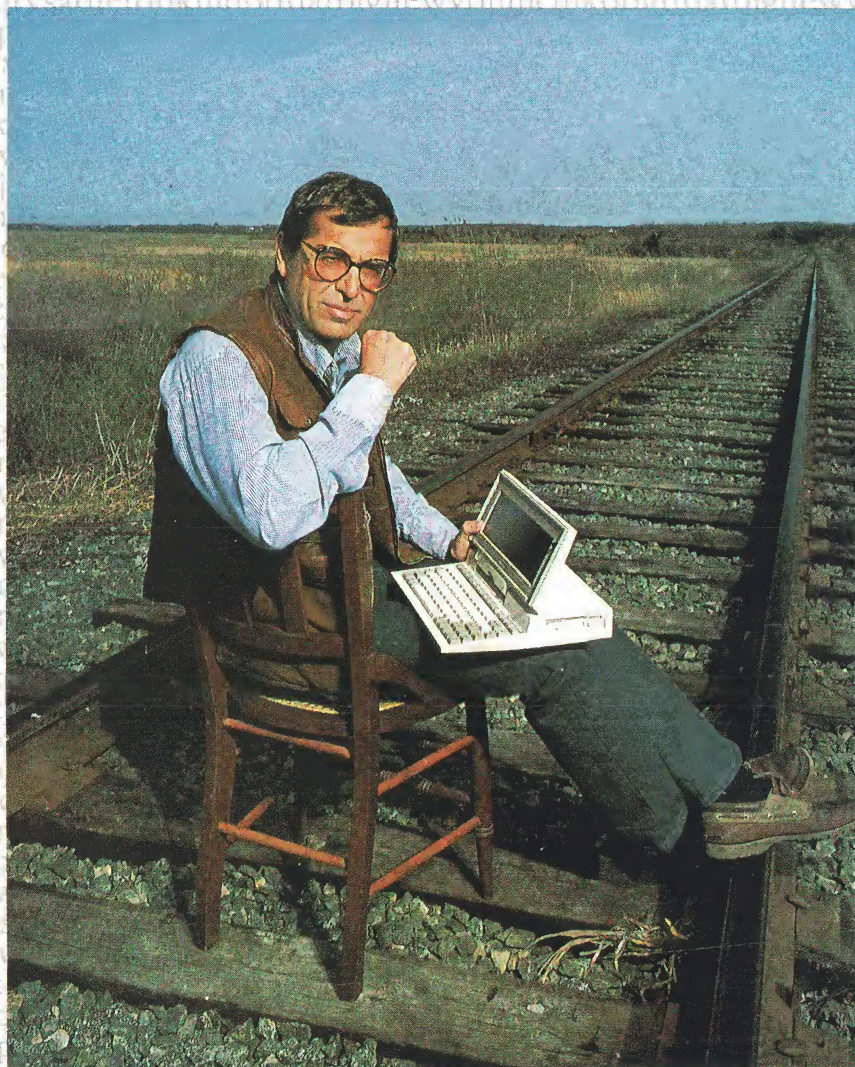
The Toshiba is small enough to fit into a briefcase and leave room enough for files, papers, your lunch, and a copy of my recent book *Riding the Iron Rooster* (480 pages), because that is precisely what I had in my briefcase. Toshiba's own carrying case accommodates a Kodak Diconix printer, which is about the size of a Gideon Bible, as well as the laptop itself, its cords, and adapters.

The Toshiba is the classic laptop, a masterpiece of miniaturization that you can use anywhere—a hotel room, a railway compartment, a booth at a pizza joint, a plane (though it's a tight squeeze in economy), or indeed at the end of a pier in Papeete.

The trouble with miniaturization is that many humans have stubby fingers and myopic eyes, and coping with something very small—even though it is perfectly formed—is sometimes a struggle.

The screen of the Toshiba is rather small; it is a liquid crystal display and is not very luminous. It works best in sunlight and is sometimes illegible in artificial light. The typeface has a drizzly and dwarfish appearance. The keyboard is a marvel, like those little bicycles

PHOTOGRAPH BY HUMPHREY SUTTON



Paul Theroux. Personal Computer user since 1988.

that chimpanzees ride, but try and ride one yourself! Your fingers need to be neatly poised over this closely packed thing, and then they go spidering onto the keys. The contraption itself will fit on even the smallest lap, and it is light enough to bring along on a journey on the off chance you might want to use it. Its size and weight are obvious virtues, but it has a greater one for me—it is silent. It merely sits there and receives your touch and translates it onto its flickering and wincing face. It does so without a murmur.

The NEC is an altogether more generous item, plumper, brighter, with a broadly spread keyboard. It also contains a woman who is eternally and monotonously drying her hair under the grid above the key-

I'd take the Toshiba to Tahiti and when I was finished writing for the day, I would ostentatiously play *Flight Simulator* for the delight of the Polynesian maidens.

board—or at least that is how it seems to me. The whirl is constant and is obviously necessary to cool the machine. But after using the NEC for a few days, I minded the whirl less than I thought I would, and the aesthetic satisfaction of such a lucid, quick-witted, and useful item was compensation enough.

The NEC is heavy, though—8 pounds heavier than the Toshiba. You would think twice before taking it on a trip, because it is the size and shape of a briefcase and in itself constitutes a piece of luggage. But that is also a virtue: the NEC is hefty, solid, and intelligently arranged, with a luminosity in its lighted screen that makes it usable in any conditions. The NEC is also far more relaxing to use than the Toshiba, which requires intense concentration because of its size. Like something that has evolved out of a desktop model but has not quite arrived, the NEC belongs on a surface more solid than someone's knees and is small only in computer terms.

Speaking generally about laptops, you could say that their vices are their virtues. Battery packs make them totally portable, so energy is no problem. But for anyone who travels, weight is the crucial consideration and always has to be considered with respect to performance.

If I had a Toshiba for the road—which I would want—I would also want a desktop computer at home. If I had a NEC, I think I would be torn between using it for everything and buying something larger—big display, big keyboard—for my office. The Toshiba is the ingeniously compressed laptop, like the Lord's Prayer written on the head of a pin; the NEC is the in-between machine.

I've used both these laptops inside the house, outside, at the beach, and so on. The NEC squats on my

lap and performs fine. If portability is the bottom line, there is no question that the Toshiba is the best choice. Yet the NEC is more restful to use. When I had totally wiped out this article by somehow sucking the text off the floppy disk, I chose the NEC as the machine to use in reconstructing it. But would I take the NEC to Tahiti? I don't think so. I'd take the Toshiba. And when I was finished writing for the day I would ostentatiously play *Flight Simulator* on it for the delight of the Polynesian maidens.

The third laptop I tried, the Zenith TurboSport 386, is an altogether different kettle of fish.

Laptop is something of a misnomer for this large, responsive, and greatly gifted creature. For starters, you need two laps—one for the screen and one for the detachable keyboard. I think you would be hard-pressed to use the Zenith on an airplane, even in first class, where the tray tables are slightly larger. It is 5 pounds heavier than the NEC and about three times heavier than the Toshiba. I realize that I am discussing this marvelous machine as though it were a side of beef, but after all, portable computers are sold for their diminutiveness, and this is such a substantial piece of merchandise that I cannot see it being carried on a trip without considerable effort. May I quickly add that the Zenith is the best computer I've had the pleasure of using. I could sit at it and work until the cows come home.

I would feel very comfortable writing a book on the Zenith. I don't think that it is a machine for a foreign correspondent or a travel writer, but if I was planning an annual meeting for lawyers in the sort of place the large law firms hold their annual meetings—places like Bali, Ovamboland, and the picturesque crags overlooking the Beagle Channel—I would order a Zenith to take along. It is heavy, but it does everything. It has a lovely display, a commodious keyboard, and all the functions one could wish for. The Zenith is not in any sense an in-between machine—it is something for a room, an office, a nonwobbling table.

One of my criteria for testing these machines was their performance outdoors—in the woods, on a picnic table, on a beach. To tell the truth, I didn't dare take the Zenith far afield. It seemed unthinkable to take something with such authority and splendor to a place where there is sand and wind or where a hermit crab might nest in it.

That is the virtue of the Toshiba; it is so tight and compact that you can take it anywhere. But the Toshiba also appears to be vastly inferior in function to the Zenith. Comparing it with the larger machine seems rather unfair, though. After all, the Zenith's equivalent in a desktop machine might be an IBM PS/2 Model 80, but the Toshiba, crafted for the sole reason of being portable, has no equivalent in the desktop world.

For my work, which is writing novels, I need a big, solid machine such as the Zenith. But I am also a trav-

eler, a writer of the sort of newspaper and magazine pieces that end up at the bottom of canary cages and are used to wrap fish. I make extensive notes in unlikely places—hotels, trains, and pretty islands in the tropics. I hate to be burdened, and I very rarely check a bag when I travel by plane. Without hesitation, I would use the Toshiba for traveling.

I wrote most of this piece on the Toshiba and the NEC, switching back and forth. When I had to rewrite it after I'd wiped out the disk, I used the NEC to do so. The final editing, rewriting, revision, rereading, and proofing I did on the Zenith. Obviously, like anyone who works all day in various places, I need more than one machine.

I found it hard at first to live in the paperless world of computing, where an error—an erased disk, a fumbled command, or an unintentional deletion—was like my heart stopping. But I am in favor of anything that makes the process of writing easier, because even at its best, writing involves considerable physical labor. This

exertion is mostly absent from word processing, and I don't miss it.

One ought to feel rather freer with a computer, for at its best it liberates the mind and allows the most random thought to be held or for prose to exist in the greatest fluidity. The computer display holds essences of light—something far more fluid and changeable than ink.

A short acquaintance with these devices produces some extraordinary effects: the strange animation of prose, the illuminated word-movie that ceaselessly ramifies and is endlessly mutable. There is something so definite, so final, so dogmatic and appalling about ink. But light—even the light of a computer screen—radiates hope. Light is the ultimate liquefaction, like ink that never dries. Writing at the speed of light is an enormous compensation for having left the certainties of the written word behind.

Laptops are irresistible, just the thing for Tahiti and, I think, everywhere else. ■

▶ laptops? humbug!

Man's best friend would have far less appeal if the beast had to be confined to an area adjacent to the hearth. So it is with your faithful computer. But consider—there's more to life than portability.

Legibility. The worst shortcoming of laptops (or portables, as some lunchbox-sized luggables are called) is the display—which is usually illegible except under ideal lighting conditions and at the perfect angle. Some laptop screens are brighter than others, of course, but usually at the expense of battery life. (Remember, too, that all laptop displays are some variation on black and white—gray, green, or amber—but never full color, although that *is* coming someday.)

Usability. Not all laptops are available with battery packs, and what's the point of a portable if you're tied to an AC outlet? Those that do have batteries can rarely operate for more than a couple of hours without recharging.

Speed. Many portables still poke along with the decrepit Intel 8088 chip, moseying down the 8-bit highway at a leisurely 4.77 MHz. A few have "turbo" 8088s, meaning

6 or 8 MHz. Several now feature 80286 or 80386 CPUs, but none are in the 20-MHz class.

Memory. Laptops generally carry at least 512K or 640K of RAM. Only a few have a whole megabyte, and even fewer have the 2 megabytes and up you'll need for future applications (OS/2, TSRs, LIM, and so on). Moreover, the RAM currently available is rarely faster than a barely adequate 100 nanoseconds.

Expandability. Some laptops have one expansion slot (in addition to slots for built-in modems or extra RAM), but none has the wealth of 16- and 32-bit slots that the meanest clone boasts.

Incompatibility. Most laptops now have 720K of memory and 3½-inch floppy disk drives. This conforms to neither the old standards (360K or 1.2 megabytes of memory, with 5¼-inch floppy disk drives) nor the new 1.44-megabyte, 3½-inch-disk standards. So to exchange data with other machines, you'll need plenty of cables and software.

Frangibility. Of course, you can sometimes exchange one of your laptop's floppy

disk bays for a hard disk, but hard disks are notoriously sensitive to even low-impact jostling. And most are comparatively slow (the best are in the 28-millisecond range, taking twice the access time of EDSI and SCSI hard disks) and limited in capacity to 20 or 30 megabytes, as opposed to the 70- to 300-megabyte fixed disks now commonplace in desktop computers.

High Latent Heat of Evaporation. Also known as *shrinkage*, meaning that the little dears are easily pilfered. (They may also be casually lost, misplaced, or forgotten, but that's your fault.) Sure, they can be insured, but that means more paperwork—and more expense (typically 7 percent of the replacement cost, each year).

Affordability. Finally, you might expect to pay less for these less capable machines, but *no*: for the price of a laptop (\$750 to \$7,500), your dollars would invariably buy you about twice the performance in a desktop machine.

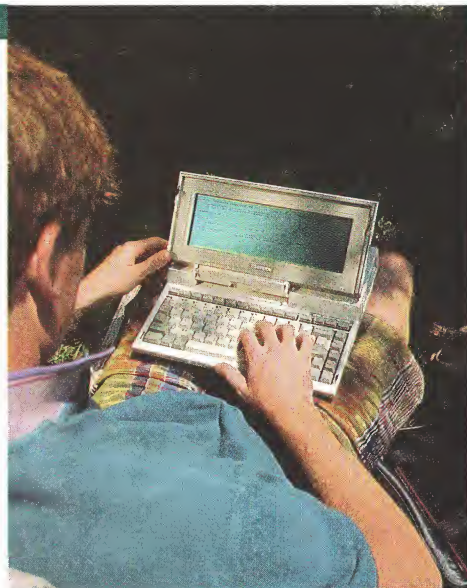
Laptops? Humbug! And yet, when you need one, there is no substitute.

—Steve Smith

Toshiba T1000

- List Price:** \$1,199
(includes processor, 512K RAM, 3½-inch floppy disk drive).
- Weight:** 6.4 lbs. with battery.
- Dimensions:** 2.1 by 11 by 12.2 inches (HWD).
- Display:** Supertwist, 80-character-by-25-line LCD.
- Processor:** 4.77-MHz 80C88.
- Memory:** 512K RAM.
- Disk Drives:** One 3½-inch 720K floppy disk drive.
- Battery:** Nickel cadmium battery provides up to 5 hours of operation.

Toshiba America Inc.
Information Systems Division
9740 Irvine Blvd.
Irvine, CA 92718
(714) 583-3000



NEC MultiSpeed HD

- List Price:** \$3,695
(includes processor, 640K RAM, 512K of firmware in ROM, 3½-inch floppy disk drive).
- Weight:** 14.3 lbs. with battery.
- Dimensions:** 3.6 by 13.6 by 12.5 inches (HWD).
- Display:** Detachable, 80-character-by-25-line electroluminescent backlit supertwist LCD.
- Processor:** 4.77- or 9.54-MHz switchable NEC V-30 (8086 compatible).
- Memory:** 640K RAM.
- Disk Drives:** One 20MB hard disk (78 ms. access time) and one 3½-inch floppy disk drive.
- Battery:** Nickel cadmium battery pack provides from 1 to 4 hours of operation.

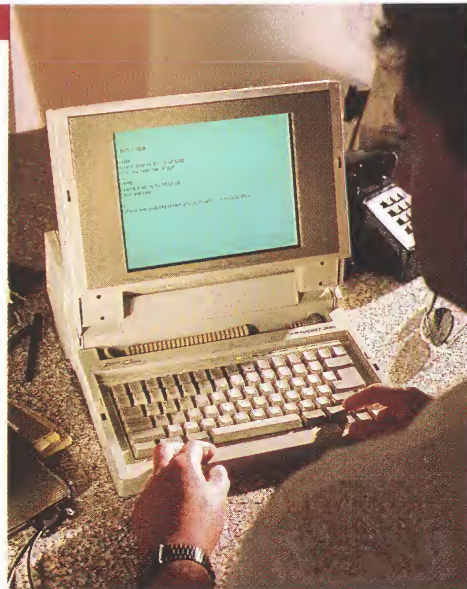
NEC Home Electronics (U.S.A.) Inc.
Computer Products Division
1255 Michael Dr.
Wood Dale, IL 60191
(312) 860-9500



Zenith TurbosPort 386

- List Price:** \$7,999
(includes processor, 2MB RAM, 40MB hard disk, and 3½-inch floppy disk drive).
- Weight:** 18 lbs. with battery.
- Dimensions:** 4.75 by 13.25 by 14.74 inches (HWD).
- Display:** Page-white 80-character-by-25-line fluorescent backlit LCD.
- Processor:** 6- or 12-MHz (switchable) with zero-wait-state 80386 chip.
- Memory:** 2MB, zero-wait-state RAM, expandable to 3MB.
- Disk Drives:** One 3½-inch, 40MB fixed disk (28-ms. access time) and one 3½-inch, 1.4MB floppy disk drive.
- Battery:** Nickel cadmium battery pack provides 2½ to 3 hours of operation. Battery recharges in 2 hours.

Zenith Data Systems
1000 Milwaukee Ave.
Glenview, IL 60025
(312) 699-4800



PHOTOGRAPHS BY BRIAN HAGIWARA

Wearry travelers who complain that any laptop is too heavy on the road usually smile when they pick up a Toshiba T1000, which tips the scales at 6.4 pounds. "At last," they sigh, "a laptop that's really a laptop."

With a 4.77-megahertz 80C88 processor, one disk drive, and 512 kilobytes of RAM, the \$1,199 T1000 is a lightweight both in heft and in processing power. But if your mobile-computing needs boil down to word processing and keeping in touch with the of-

fice via modem, the T1000 is the machine of choice. At 2.1 by 11 by 12.2 inches, it will fit into just about any piece of luggage.

Toshiba has managed to squeeze an 82-key keyboard, including ten function keys across the top, into the diminutive machine. The supertwist LCD screen has no backlighting, and its 3¼- by 9¾-inch size is unusually elongated. In some applications, a certain amount of "squashing" is noticeable. Back in the office, however, you can hook up the

machine to a composite or CGA monitor and bypass the display altogether.

The essential option for the T1000 is the \$399 768K RAM card. The battery-powered RAM card helps compensate for the lack of a second disk drive and the shortage of standard memory. You can use 128K on the card to bring basic memory up to 640K. Additional RAM can be used as expanded memory or turned into a RAMdisk, which will increase battery life and free you from the hassle of constantly

switching program and data disks in and out of the drive. DOS (Version 2.11, unfortunately) is built in, and Borland's *SideKick* suite of utilities is also a standard feature.

Toshiba also sells a \$399 internal 1,200-baud modem to turn the T1000 into a communications tool. For people who have been lugging around 15 pounds of hardware simply to write memos and send them back to the office over the wire, a T1000 with a modem is worth its weight in gold.

—Preston Gralla

Like many other midrange laptops clustered around the \$3,500 price point, the 14.3-pound NEC MultiSpeed HD is the improved version of two earlier machines that were lacking in two vitally important departments: display quality and mass storage capability. Both problems have been deftly handled in the MultiSpeed's latest incarnation.

HD stands for hard disk, and the MultiSpeed has a 20-megabyte model that will run for about 1 to 4 hours with av-

erage disk access before the battery runs down. The laptop's other major power eater is an excellent backlit supertwist LCD screen that presents crisp blue characters on a gray background. You can shut down both the backlighting and the hard disk at your discretion to prolong the life of the battery.

Processing power comes from NEC's own CMOS V-30 chip, running at a speedy 9.54 MHz. Also included in the \$3,695 price are one micro-floppy disk drive; 640K RAM,

128K of which can act as a battery-backed RAMdisk; and 512K of firmware in ROM, including a setup program, auto-dialer, outliner, and notepad.

The MultiSpeed has won many converts because of its outstanding keyboard. The 85 keys have excellent tactile response. A separate numeric keypad is in the upper-right-hand corner, and, best of all, the ten full-size function keys are in two columns on the left-hand side.

Parallel and serial ports are standard on the MultiSpeed.

An RGB video port lets you bypass the LCD display when you're using the laptop as your desktop machine. With the HD version, the MultiSpeed is a leader in terms of price, performance, and portability.

—P.G.

By no stretch of the imagination is the TurboPort386 a laptop computer. It is a high-performance, high-priced heavyweight. The TurboPort is better described as one of the smallest 80386-based desktop machines around, and the 386 portable with the best display of them all.

The unique design of the TurboPort evolved from the need to keep heat-generating components cool. A thicker-than-usual pop-up display panel houses the processor so

that air can circulate freely. The main body of the machine houses the expansion area, and while the keyboard up front is detachable, the short coiled cable keeps it from straying.

The machine is built around a 12-MHz 80386 processor that can be downshifted to 6 MHz. Also included in the \$7,999 price are 2MB RAM, a 40MB hard disk, and a micro-floppy disk drive. Battery operation is possible, but not for more than 2½ to 3 hours. The Zenith has a detachable exter-

nal nickel cadmium battery pack, which makes the unit easier to carry. A 2,400-baud modem is available for \$500.

The real eye-catcher of the TurboPort is its marvelous page-white display. When it comes to display technology, Zenith is on the cutting edge. This display adds an extra polarizing layer that filters out most of the blue light that usually seeps through: the result is a brightness and sharpness not seen on any other portable display.

The keyboard is another

story. It feels far too light and flimsy, a sensation that is particularly unacceptable for an \$8,000 machine. The TurboPort isn't as wide as classic lunchbox machines, such as the Compaq Portable III, so the keyboard layout is not nearly as complete as it should be for a 386 machine; in fact, the TurboPort actually has three fewer keys than the tiny Toshiba T1000. The keyboard may keep the TurboPort from succeeding as a tiny but tremendously powerful desktop machine.

—P.G.

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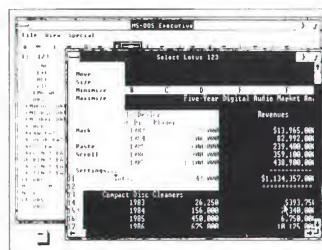
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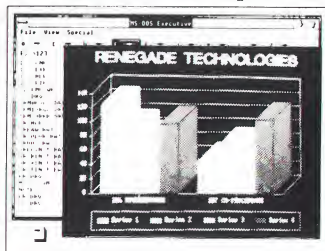
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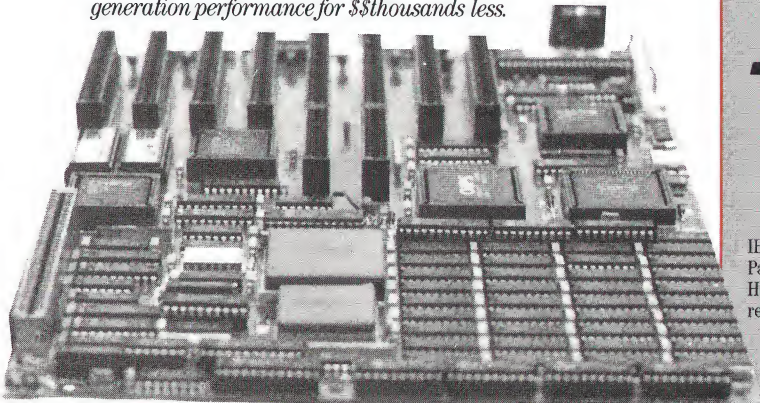
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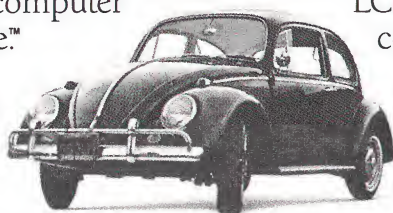
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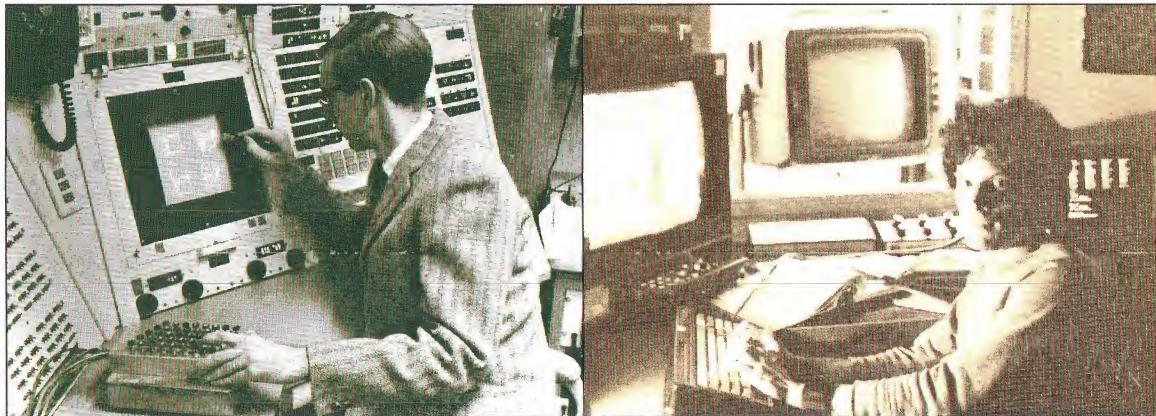
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art at the speed of thought

Will the PC replace the palette in painters' studios?
For some of the art world's most respected citizens, it already has.

By GEORGE DAMON LEVY

Merging art and science: Computer scientist Ivan Sutherland (right) demonstrates *Sketchpad*, the first interactive graphics system, in 1963. Today, fine artist David Em (far right) has more capable tools to work with at his post at the California Institute of Technology's Jet Propulsion Laboratory.



Artists quest after a perfect way to translate artistic vision into sight and sound. In the past, the medium might have been a new pigment or stylus. Today, increasingly, it is the computer. An exhibition at the IBM Gallery of Science and Art in New York, "Computers and Art," showcased works of computer-assisted artists and underscored the increasing acceptance of computers within the fine arts community.

Acceptance has been a long time coming. In the beginning, many artists regarded the computer with suspicion. In *Digital Visions* (Abrams, New York), Cynthia Goodman, curator of the "Computers and Art" exhibit, writes that musicians made an easier transition from analog to digital formats. Lejaren A. Hiller, for example, first programmed an electronic musical composition, *Illiac Suite*, in 1957.

But before the advent of the personal computer, computer technology was inac-

cessible to most artists and an awkward, inadequate tool for expressing ideas and images graphically. In 1962, Ivan Sutherland created a graphics system called *Sketchpad*, an impressive development for its day, but hopelessly primitive. Its output was little more than stick figures.

Even as technology improved, there was no rush to embrace computers. "The enormous mainframes," writes Goodman, "occupied entire rooms and required a large staff to maintain them. Their settings did not appeal to most artists, who understandably preferred the comfort of their studios to sterile laboratories and the seemingly labyrinthine procedures that often accompanied admittance to sophisticated computer systems."

The PC was the turning point. When personal computers arrived in the late 1970s, processing power and high-quality video displays came within reach. Sud-



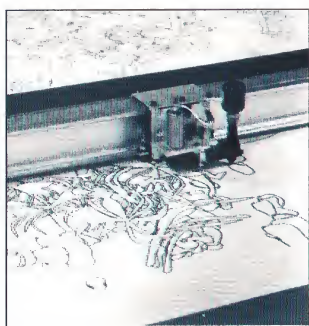
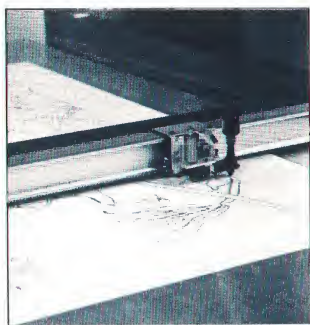
It's like there's a vanishing point at which art and science merge—and we're standing smack at the center of that point.



Robin Cook directed *Road to Point Reyes* (1986), a collaborative "one-frame movie." It took six programmer/artists to create the different effects.

Each effect, from rainbows to ripples in puddles, had to be built separately, then composited to form the completed work.

Where does science leave off and art begin? Does it matter?



AARON is the name of the program British painter Howard Cohen created to generate the line drawing for *Untitled* (1985) on a MicroVAX II. Cohen added watercolor later. Top and bottom photos show **AARON** at work.

denly, artists could equip their studios with easy-to-use computers of enormous capability—computers that made the creative process easier, not more complex.

Since then, artists have found more and more uses for the new technology. “For some,” writes Goodman, “the computer is merely a tool that facilitates design decisions; for others, the artwork itself assumes the form of direct computer output; still others think of computer output as the point of departure for further elaboration and execution in an entirely different medium.” (Painters, for example, use computer-generated images as “blueprints.” They work out an idea on their terminal, project it onto canvas—and then paint the canvas by hand.)

Some artists still shun the computer for philosophical reasons. Others cite ongoing technical limitations. No one, for example, has found a method of transferring the literal image from the luminous video display to paper or canvas. But as computers become simpler and more capable, resistance is wearing down. Says Darcy Gerbarg, a well-known computer artist who teaches at New York’s School of Visual Arts, “This is not a physical medium, so it can keep pace with your thoughts. Artists are fascinated by the creative potential that they can unleash in themselves with these tools.”

Contemporary graphics programs are a key. They incorporate advanced technology but seem more like traditional tools. The menus that appear on the PC screen present an easy-to-understand image of a “paintbrush” cursor and shield the user from needing to know about screen pixels and memory bytes. The programs respond to drawing motions and menu selections instantaneously. It’s no-wait paint: a few keystrokes or mouse clicks make lines and colors appear.

The computer encourages these new computer artists to think more freely and play what-if games with no risks. It allows each artist to change an image as quickly as his thoughts—and change it back again. If the artists share anything, it is their questioning minds and impatient dreams in search of new technology.

George Damon Levy is a senior editor of PC/Computing.

PHOTOGRAPHS, TOP AND BOTTOM, BY BILL WYLIE; CENTER BY BECKY COHEN

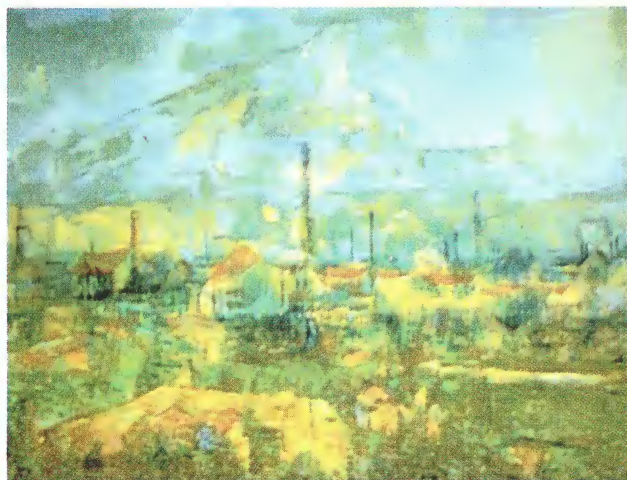
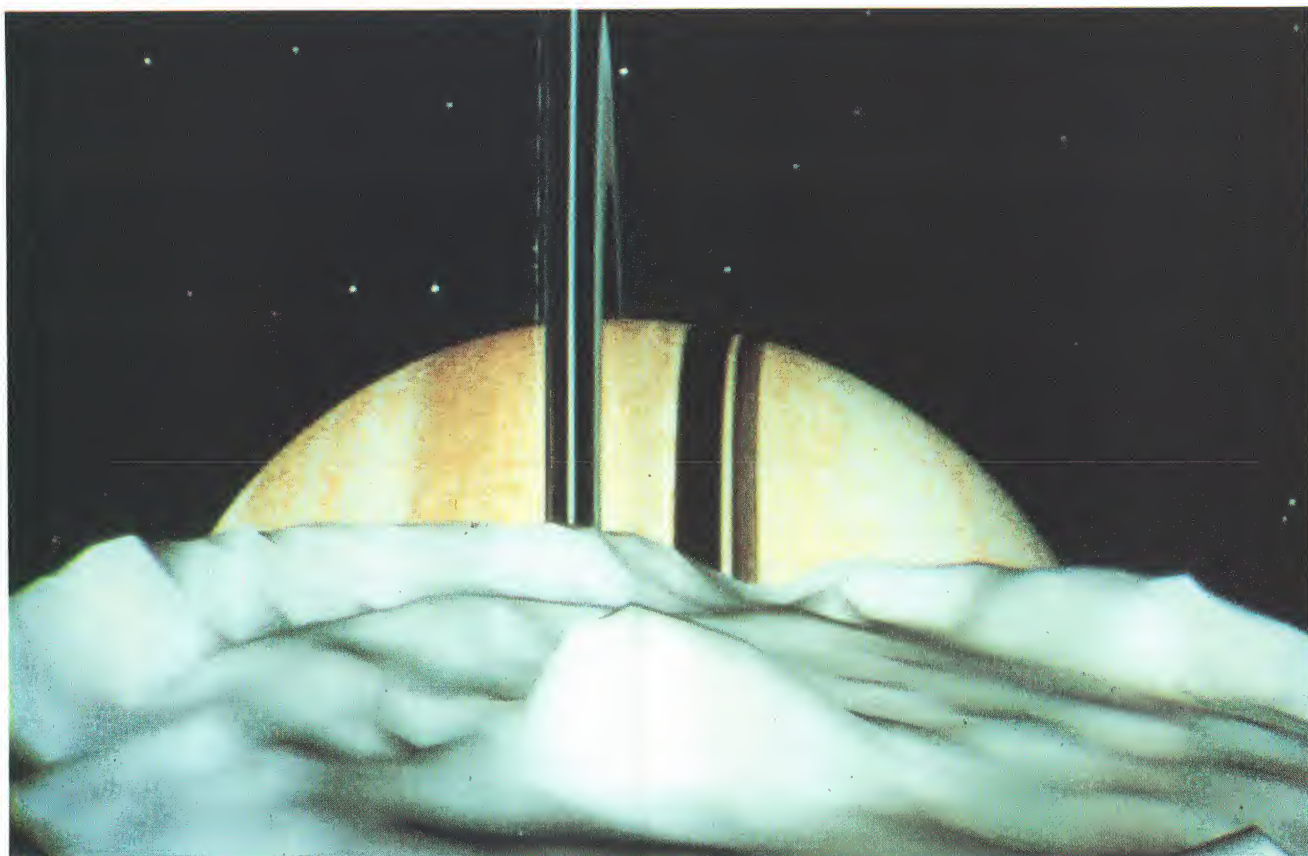


Changing the Fractal Dimension (1983), by Richard F. Voss, uses fractal geometry to create an ultrarealistic tableau. Fractals are based on the principle of “self-similarity,” that a large form is composed of smaller, nearly identical shapes. The technique permits unprecedented detail and is in vogue for representing natural phenomena. Differences in the landscapes at right are due to changes in the fractal dimension of the program.



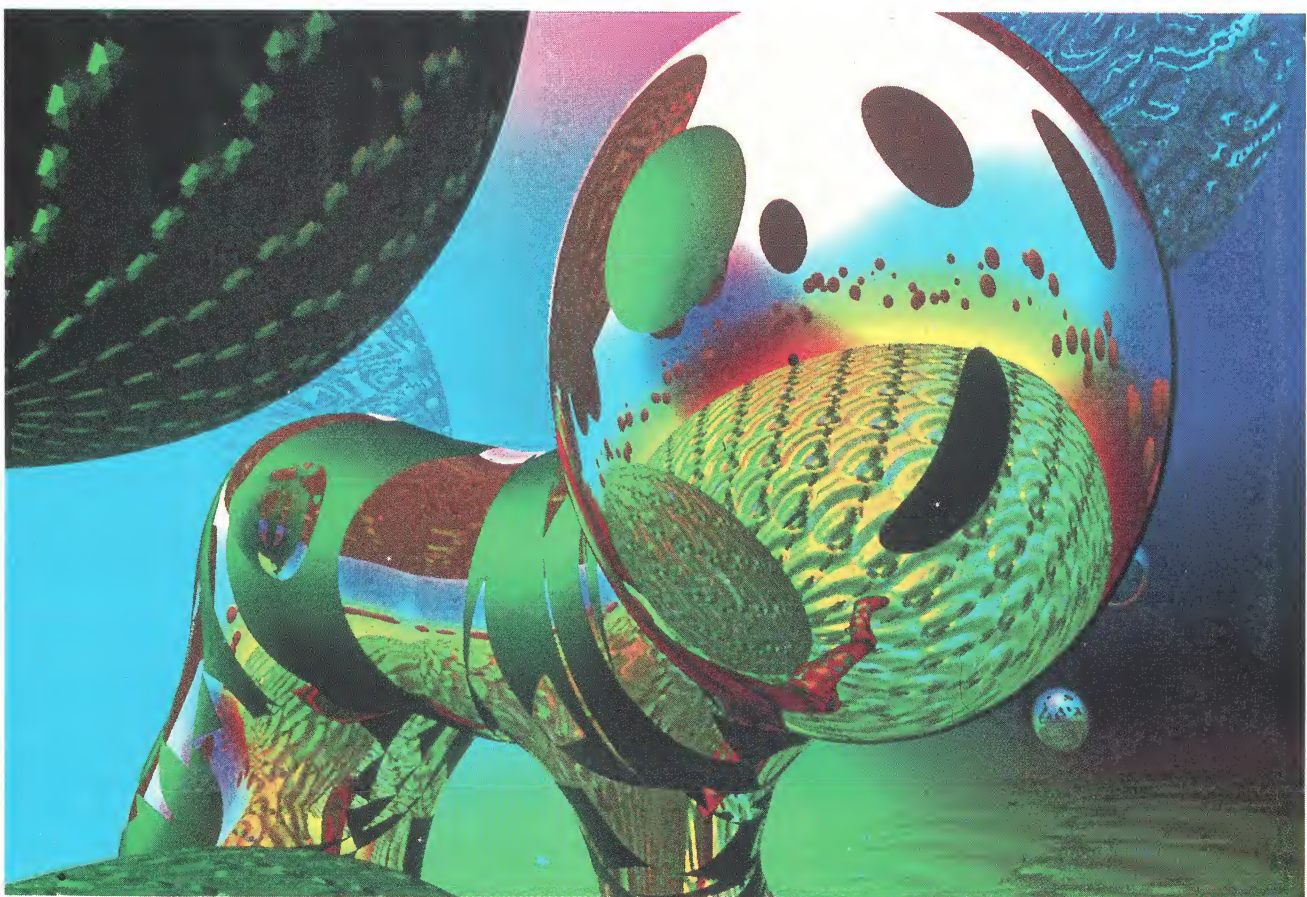
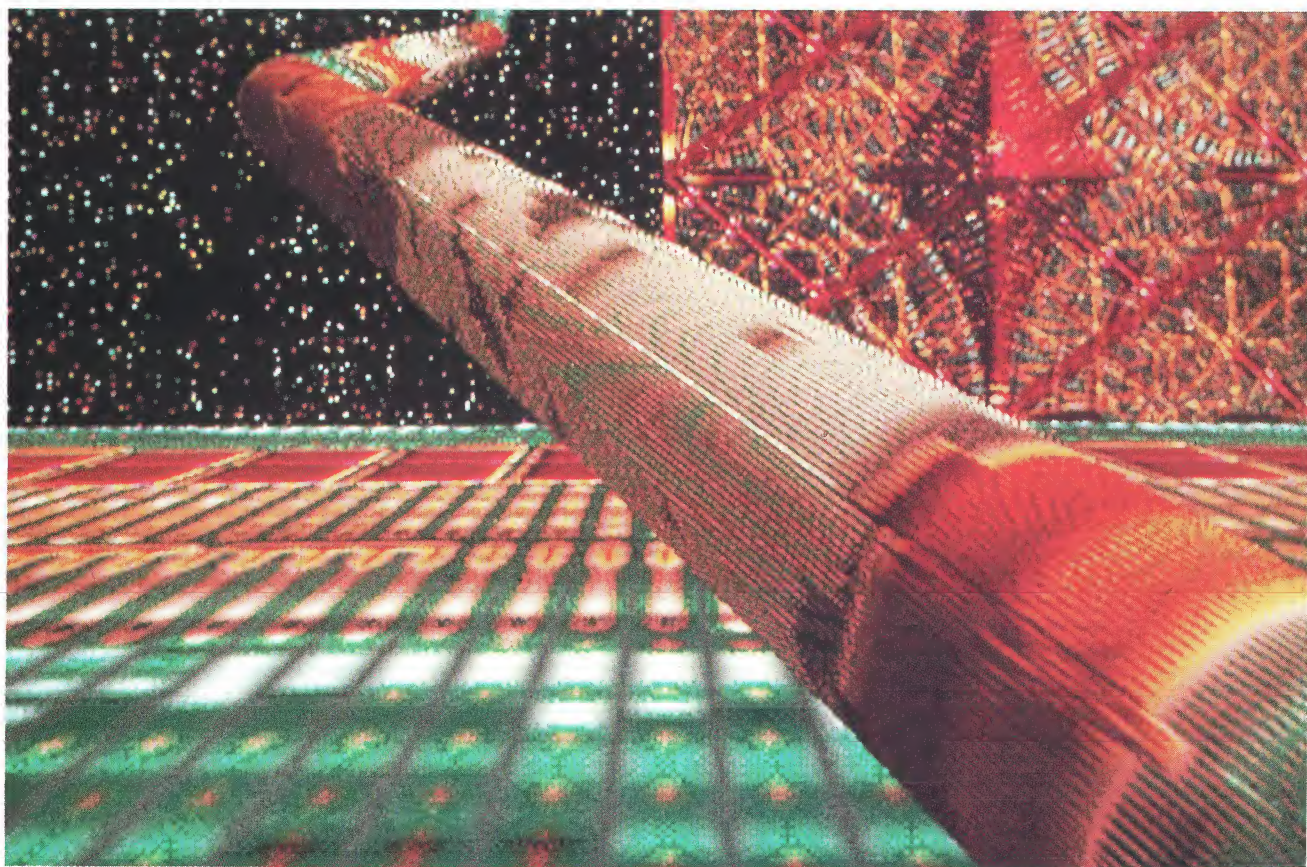
Suddenly it occurred to us, Why be restricted to reality?

portfolio

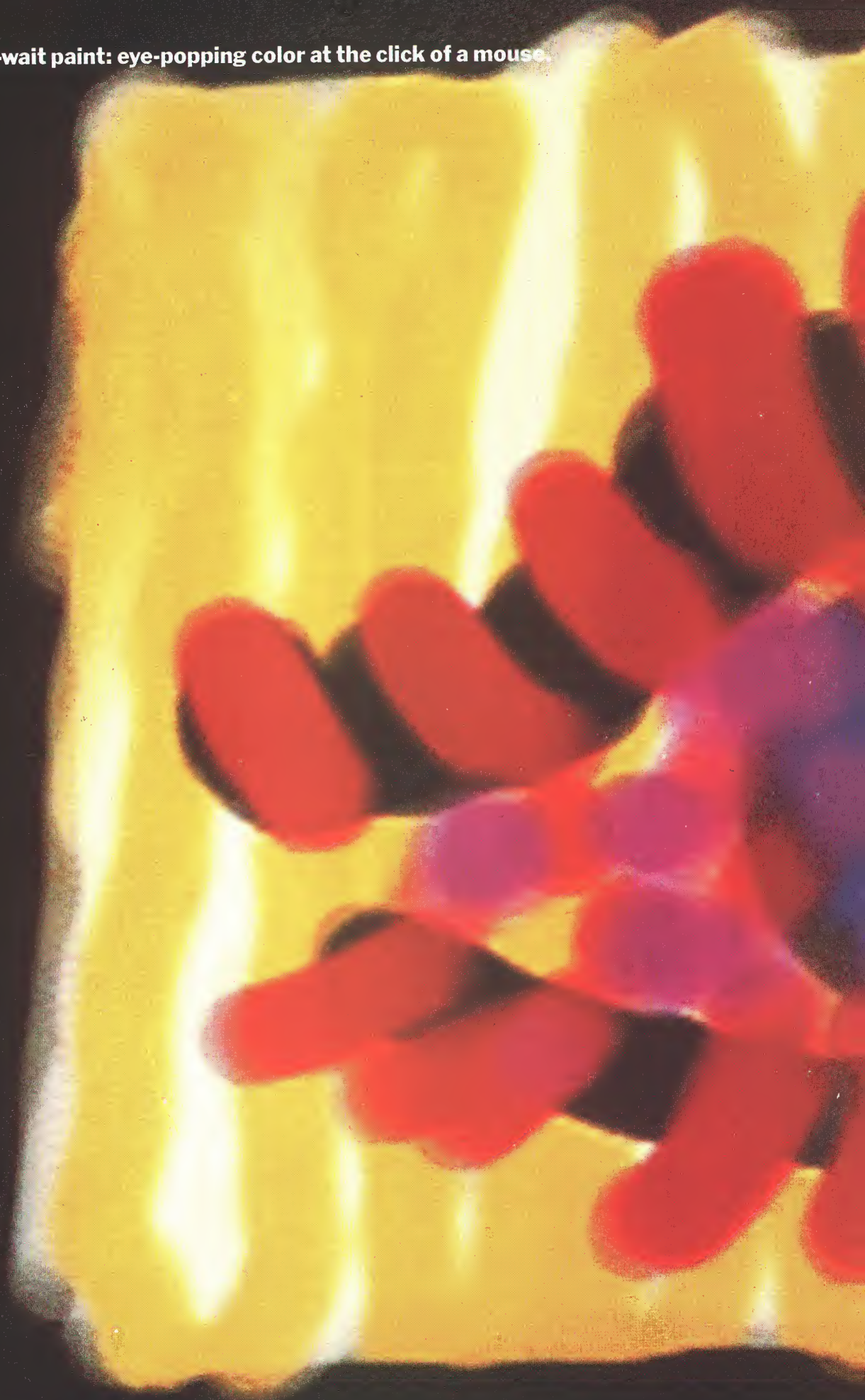


Nancy Burson used an IBM PC to create *Untitled #5* (1985-86), a composite of a Cezanne rendering of Mont Sainte Victoire and van Gogh's *The Huth Factories*. A still frame (above) from James Blinn's film, *Mimas Day* (1981), shows effect of "bump mapping." Blinn, a leading computer scientist, devised the technique in 1976 to permit application of texture to computer-generated surfaces. (Prior to bump mapping, computers produced only smooth-surfaced images.) *Transjovian Pipeline* (above right) is a 1979 David Em

work. Schooled as a fine artist, Em began experimenting with computers in the mid-1970s. Later he worked at Cal Tech's Jet Propulsion Laboratory, where he merged Blinn's programs with his own. *The Art of David Em* (Abrams, Inc., 1988) is the first book about a painter who uses a computer as his principal medium. A frame from *Ocean* (below right), a 1986 film by Yoichiro Kawaguchi. Kawaguchi is one of the few whose formal training is in computer graphics filmmaking as art form.



This is no-wait paint: eye-popping color at the click of a mouse.





Howard Hodgkin used the thickest "brush" in a Quantel Paintbox to create this 1986 set design for *Pulcinella*.

how to install a floppy drive

The problem: You need to exchange files between your older desktop PC and a laptop or one of today's PS/2 machines. Your PC uses 5¼-inch floppy disks and the other computer uses 3½-inch floppies. A simple solution: install a 3½-inch drive in your desktop PC. Exchanging files becomes a snap.

Perhaps the only reason more people don't install their own 3½-inch drives is a lack of faith—both in their own abilities and in the ruggedness of the PC. But with a little patience, and by following our advice, the job can be done in a few minutes.

The first step is to buy the drive or drives to install in your computer. With a dual-floppy PC you'll need just a single 3½-inch drive to replace one of your old drives. If you have an XT with a hard disk, you'll want both a 3½-inch drive and a half-height 5¼-inch drive, so both will fit in the single drive bay that will be available when you remove the standard floppy disk drive.

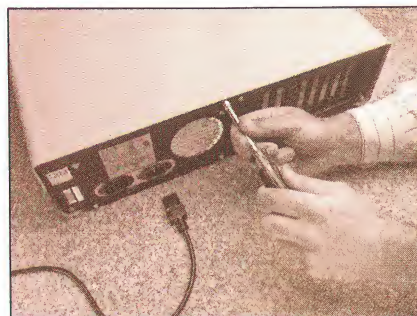
You may want to take the latter approach with your PC, too. It will free a whole drive bay for possible use with a hard disk. And the new drive will replace the one part of your PC that's most likely to fail with age.

Four of your best choices are 3½-inch drives made by Chinon, Sony, Teac, and Toshiba. Matching 5¼-inch drives are available for each.

You'll want to be careful when you order because 3½-inch floppy drives are narrower and shorter than their 5¼-inch counterparts, and they use different connectors. To make the drive fit and plug in, you'll need a mounting kit with adapter brackets. Most drives include one at no charge, and some even offer a choice of colors—PC black or AT beige.

Two capacities of 3½-inch drives are available—720 kilobyte and 1.44 megabyte. Although more desirable, the bigger drives are more expensive and may impose an additional penalty. They won't work in your PC or XT without the help of a new drive controller. Two possible replacement controllers include Western Digital's WD-1002-FOX floppy disk drive controller and the DataTech Enterprises DTK Mini/Micro FDC, a Taiwanese clone card that's widely available for about \$75 retail.

You may also need software, depending on the operating system you have. DOS 3.3 supports both 720K and 1.44MB drives. DOS 3.2 supports only 720K drives. Earlier versions of DOS will require special driver software, which is usually included with the disk drive. To avoid surprises, check to be sure before you buy.



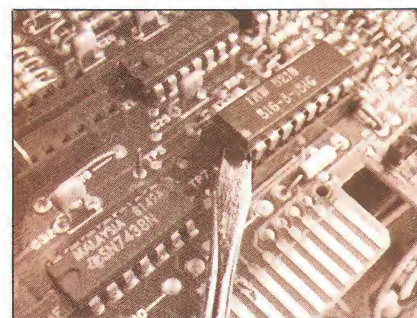
1

Switch off and disconnect all cables from your PC, then remove the five screws holding the top of its case. You'll find one screw in each corner of the rear panel and the fifth in the center near the top. Slide the cover forward and off, raising the front slightly at the end of its path to clear the front of the chassis.



2

Remove one of your old drives. IBM PC and XT floppy disk drives are held in place solely by two screws on one side of each drive. Once you remove these screws, unplug the cables from the drives you want to replace, and pull them straight out through the front of the chassis.



3

Next, prepare your drives. Most floppy disk drives are sold with termination resistors installed, but it's required only on Drive A:. Remove it from your B: drive.

The termination resistor looks like an ordinary integrated circuit. Sometimes it's just a sliver of plastic 1 inch long, ½ inch high, and less than 1 inch thick. In any case, it's usually the only chip on the board mounted in a socket, typically rear-mounted near the ribbon cable connector. Simply pry off the termination resistor from the drive you want to make drive B:.

A 3½-inch drive makes file transfer simpler. Here's the way to do it yourself.

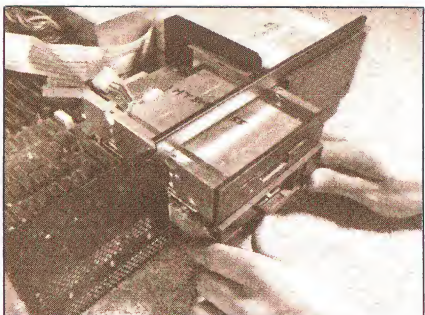
By WINN L. ROSCH

4



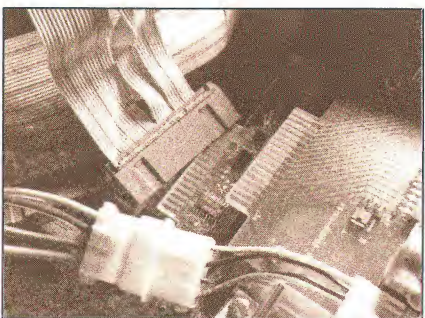
You may also have to adjust drive select jumpers or switches. You can identify the drive selects by their labels—DS0, DS1, and so on. Some drives start counting with DS0, some with DS1. Set all floppy disk drives in your system to the second position—DS1 on drives that start with DS0 or DS2 on drives that start with DS1.

5



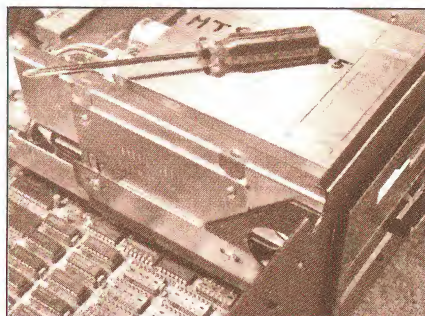
Now slide your new drives into the chassis. If you're putting a single half-height drive in a bay, it must go in the bottom of the bay with a blank panel above. If you use adapter brackets, install only the bracket on the side of the drive that will be inaccessible.

6



Attach one of the white connectors from the power supply to each drive. Next, connect the ribbon cable that runs to the controller. Drive A: gets the connector located near the twist in the cable. The connector in the middle of the cable goes to drive B: The remaining end goes to the controller. Note that proper installation requires that the side of the cable with a red (sometimes blue) stripe goes to the side of the connector on the drive that has the number 1 or 2 next to it, nearest the slot cut between two of the fingerlike gold contacts on the drive.

7



After your drives are loosely installed in your computer chassis and all the cables have been attached, slip the remaining mounting bracket between the stack of drives and the side of the drive bay, then screw the bracket to the top drive. Line up the holes in the chassis, bracket, and bottom drive, and screw it in place.

Test your installation before you slide the cover back on your computer. Then try to read a directory from your new drive, referring to it as the B: drive.

If that doesn't work, you may have to include the entry `DEVICE=DRIVER.SYS` in your system's `CONFIG.SYS` file (and copy the file `DRIVER.SYS` to all of your boot disks). Even if the instructions that came with your drive don't mention adding this entry, it won't hurt to try it. Once you do, your new drive may react as drive C: (in PCs without hard disks) or as drive D: (in XTs and PCs with hard disks).

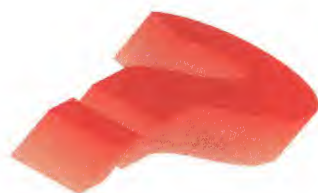
Slide the cover back on, screw it in place, and you're done. The entire installation shouldn't take more than half an hour, and you'll save many times that with the convenience of making direct disk-to-disk file transfers.

Which disk capacity is right for you? Most laptops, including the IBM Convertible, use 720K floppy drives. All Micro Channel PS/2s use 1.44MB drives. Since 720K drives can be \$10 to \$30 cheaper than their larger-capacity counterparts, they may seem like the better buy. In fact, a 1.44MB floppy drive can do everything a 720K drive can do, plus store more. That makes bigger better.

A 720K drive cannot read or write 1.44MB disks, but a 1.44MB drive can read and write 720K disks. Moreover, a 1.44MB drive makes a better backup system for your hard disk. On a pennies-per-megabyte basis, media for the larger-capacity drive are more economical.

In down-to-earth terms, the 720K drive's day is over. It's a dinosaur in miniature. In the long run, you'll be happier with the greater capacity, compatibility, and convenience of a 1.44MB drive. ▀

IS DOS DEAD



**It's the single most
popular and successful
software package
ever written and
its days are numbered.
The countdown has
begun to a rational,
affordable successor.**

By JOHN DVORAK

As Bruce stomped on the accelerator of his brand new red Ferrari Testarossa, he heard a news bulletin over the radio:

"Attention. . .this just in. . .DOS is dead," blurted the disc jockey. Just then, the cellular car phone rang. A voice on the other end screamed at Bruce: "Sell your stock in Microsoft! DOS is dead!"

Bruce gasped and shook his head in disbelief. Only last week he'd learned that the fabled operating system wasn't pronounced "dohs," as he and his friends had pronounced it over the past few years. "Gee, you learn something new and it goes for naught," he lamented.

—from Palmer Quinlin's unpublished novel *Silicon Blues*

If there is an issue in personal computing that dominates the conversation in 1988, this is it: Is DOS dead?

The issue is never argued logically, since few of the participants are without a vested interest, either in the demise of DOS—the operating system licensed to IBM (as PC-DOS) by its publisher, Microsoft (which supplies MS-DOS to other customers)—or in its continued existence.

In 1982, one year after the announcement of the 16-bit IBM PC, a popular microcomputer magazine interviewed 15 industry figures for a story headlined "Is 8-bit Dead?" Without exception, the responses were nothing more than reflections of vested interests. It was amusing that 13 of those interviewed said 8-bit was getting better every day—the sky was the limit. Only two felt differently: Bill Gates, the chairman of Microsoft Corp., and Tony Gold, founding publisher of *PC Magazine*.

Today, much of the software written specifically for MS-DOS won't run under anything but DOS. This includes any DOS-specific memory-resident (TSR) utility or program. It's no coincidence that Borland International's head honcho, Philippe Kahn, for example, eschews the notion that Microsoft's new and much-

talked-about operating system, OS/2, will achieve any popularity. Kahn, after all, sells *SideKick*, a TSR program that makes no sense in an OS/2 environment.

At the same time, we see that many of the most-vocal proponents of OS/2 have just finished a book outlining OS/2 and its wonders. It's like Jimmy Swaggart endorsing Motel Six. We can expect no objectivity from these folks, period.

But we have to take sides for a moment when we ask if DOS will live forever. Can it?

No way.

This is regardless of the fact that MS-DOS is the single most popular and successful software package ever written for any computer. There are more than 14 million copies in use. Other very successful products such as *Lotus 1-2-3* or *dBASE III* need DOS, as does every other popular PC software product. The success of such programs pales in comparison with that of DOS. I think we can rest assured that every reader of these words will be dead before the last MS-DOS computer is abandoned.

So how can we talk about the death of DOS? Well, just because it's still in use doesn't mean it's still hot. In fact, that doesn't even mean it was ever hot. Let's face it, DOS was the only game in town.

There has never been much pressure to improve DOS; it has remained virtually unchanged since the release of Version 2.0. A few patches and features were added with Version 3.0, but the major flaws and drawbacks remain. DOS may already be dead, but it's been a long wait for the coroner.

Let's take a quick look at the background of DOS. It was born when IBM was shopping around for an operating system for its new computer, the IBM PC. At the time, the dominant "serious" operating system for personal computers (of the non-Apple variety) was CP/M, from Digital Research. CP/M was developed as a common interface and operating system for computers that



used the 8080, 8085, and Z-80 microprocessors. It allowed users to install a variety of displays and disk systems and actually make them work well together, a not-so-common situation in the 1970s. CP/M was easy to use and appealed to the growing band of small-computer users. It was the odds-on favorite to be the operating system for any IBM offering.

Many assumed IBM would choose a Z-80 chip for its new machine. But Exxon owned Zilog, the manufacturer of the Z-80 chip, and Exxon spent too much time rattling its sword, threatening to destroy IBM in the growing office-automation market. This did not make IBM feel comfortable about relying on Exxon for chip

At first it wasn't clear that DOS (or the personal computer, for that matter) would succeed. It did. Now, to understand the possible demise of DOS, we have to understand the reasons for its success. Success is spelled L-O-T-U-S.

supplies. So IBM turned to Intel Corp. and the 8088 chip.

When IBM rolled out a 16-bit computer with CP/M-incompatible software and a new operating system, observers were startled. The big surprise was the operating system, then called PC-DOS. Microsoft had hurriedly bought the rights to a CP/M clone developed by Seattle Computer Products and sold it to IBM as PC-DOS, and eventually to clone makers as MS-DOS. To the user, the clone seemed almost identical to CP/M except that it ran on the 8086 and 8088 chips.

At first, it wasn't clear that the new operating system (or the computer, for that matter) would succeed. To understand the possible demise of DOS, we have to understand the reasons for its success. Success is spelled L-O-T-U-S.

Lotus 1-2-3 turned the PC into the darling of the business user. *Lotus 1-2-3* did for the PC what *VisiCalc* did for the Apple II: it gave the computer a raison d'être. Since *Lotus 1-2-3* ran under DOS and not under the other two operating systems available for the PC (CP/M-86 and the 8-bit Z-80 system), they soon disappeared. Once the software bandwagon turned toward MS-DOS, it was all over for CP/M, the 8-bit Z-80, CP/M-86, *VisiCalc* itself, and scores of little software

development companies.

This kind of scenario is the key and must be repeated if something new is to emerge. There must be a significant reason to change.

The current alternatives to DOS do not have a partner with the lure of *Lotus 1-2-3* to initiate a major change. OS/2 is the most talked-about new operating system. Experts will tell you its design is based on solid operating-system principles that should make it a fabulous product. But as far as the user is concerned, what does OS/2 really do besides load a program and run it? We already have that capability in MS-DOS. Why should we pay \$400 more for the same privilege?

Well, OS/2 can also run two or more programs at once. This multitasking, while lacking in DOS, can now be done with an add-on product called VM/386 from IGC in Santa Clara, California, and even with *Windows/386* from Microsoft. Providing, of course, that the user has an expensive 80386-based computer.

A particular advantage of VM/386 is that it runs multiple programs the user already owns. No special programs or additional purchases are needed. But none of the programs can be larger than 640 kilobytes—a limit that continues to plague the MS-DOS world.

OS/2 obliterates the 640K barrier. But so do newer expanded- and extended-memory schemes, such as the jointly developed LIM 4.0 (from Lotus, Intel, and Microsoft), which still works with the old DOS and the old programs. But all of these schemes are still DOS patches that might create havoc with some software. Many programs are sloppy and don't run properly in patched systems.

While OS/2 supposedly eliminates many of these problems, it requires software designed specifically for OS/2. And developers moan about how hard it is to write programs for OS/2.

To muck things up further, developers have made it clear that OS/2-compatible software will cost more than DOS software. OS/2 also requires an 80286-based machine (as a minimum), and it runs well only on an 80386. More and more, OS/2—as good as it may be—begins to look less like software and more like a cog in a complex marketing scheme designed to sell upgrades, add-ons, and expensive new versions of old programs.

The other alternatives to MS-DOS are far worse. At least OS/2 can pretend to be DOS and run a DOS program the old-fashioned way—as a single task. Moreover, the commands in OS/2 are almost all identical to




why not?

MS-DOS commands. But the alternatives to OS/2 and DOS are earmarked by outrageous incompatibilities and incredible difficulty of use.

Unix is the most-mentioned alternative. Ever since its invention in 1969 as a hardware-independent operating system, Unix has been pitched by programmers as the greatest thing to hit the computer business since the invention of the keyboard. Real-world users have not been so enthusiastic. Unix was designed by programmers for programmers; its unavailing interface and dopey commands reek of arrogant elitism.

To make Unix acceptable to end users, computer manufacturers have to design complex shells that shield the user from the Unix kernel. In essence, the user talks to the shell and the shell talks to Unix. The shell takes plain-English commands or creates menus through which users must plod as the only means of instructing the machine.

The problem is that people seem to dislike shells. IBM's venture into the shell concept, a dud called *TopView*, forever destroyed the notion that shells are what people want. It turns out to be easier to execute, say, *WordPerfect* by typing WP at the C: prompt than to scroll through hundreds of programs to find *WordPerfect*, highlight it on a menu, and then execute it with some peculiar command. Too much work.

Then there's the so-called graphical interface. People can't stop talking about it. If we are to believe the majority of professional pundits and industry visionaries, we have to accept the possibility that the next operating system will have, as an inherent element, an icon-based user interface similar to the one used by the Macintosh. Some cynics have dubbed it the WIMP interface—for Windows, Icons, Mouse, and Pull-down menus.

The advantage is that, if done properly, this approach gives all applications a similar "feel" and command structure. The user can quickly learn a new application without having to read volumes of boring documentation. For most applications, the idea works. But for the most-complex programs, such as *AutoCAD*, it becomes a hindrance as the menus get too long and complicated.

IBM, in conjunction with Microsoft, wants to implement a "common graphical interface" that uses as its starting point the OS/2 Presentation Manager—a complex (and, doubtless, costly) addition to OS/2 that gives the screen a Macintosh look. IBM wants a common user interface so all the applications have a sameness. For example, you always hit function key F1 when you need help. The grand plan is called SAA (Systems Application Architecture). The commonality is to work its

It's sometimes said that if you copy from one person, you're plagiarizing, but if you copy from a lot of people, you're doing research. In this sense, OS/2 is the most researched operating system ever created, developed through a joint effort by IBM Corp. and Microsoft Corp. as a successor to DOS. It combines software technologies developed at both companies with features of operating systems for minicomputers and mainframes.

OS/2 runs on personal computers built around the Intel 80286 or 80386 microprocessors. This includes the IBM PC AT and compatibles and the IBM PS/2 Model 50 and higher. OS/2 uses the "protected-mode" operation of the 80286 chip to expand memory from 1 to 16 megabytes and for fast, efficient multitasking.

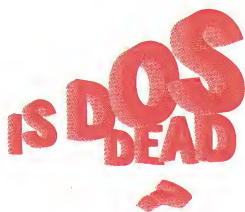
Three major components make up OS/2. At the center of the operating system (hidden from the user) is the OS/2 "kernel." It is responsible for maintaining files, managing several programs that may be running simultaneously, and allowing these programs to communicate.

Users of OS/2 will see the operating system as a windowing environment called the Presentation Manager—the second major component of OS/2. The Presentation Manager extends the multitasking capabilities of the kernel in order to allow several programs to run simultaneously on the same screen, each program occupying its own window. Programs running under the Presentation Manager have a consistent user interface that makes the programs easier to learn and use.

The third major component of OS/2 is the Graphics Programming Interface (GPI), a powerful graphics system. OS/2 programs use graphics as readily as DOS programs use plain old text.

The promise of OS/2 is programs that are more powerful and easier to use. Right now, OS/2 is mostly in the hands of programmers. The applications that really take advantage of OS/2 should begin to appear in 1990 and continue for the entire decade.

—Charles Petzold



way right up through IBM's mainframe programs.

The irony is that while this has already been done by Apple (and proven effective), it may now be passé. With the release of *HyperCard* for the Macintosh, much of the application-to-application commonality has gone out the window in favor of point-and-click software buttons that appear all over the screen. SAA may already be too little, too late, and out of touch with current thinking by the time we first see it: DOS enthusiasts will sit back and laugh.

Many users question the need for a graphical and common interface in the first place. Lots of users like a simple command-line interface. It's not that difficult to master, and it's the most efficient interface of all. You simply tell the machine what you want. These users also argue that it doesn't take a genius to master different commands for different software, and that few people use more than three or four packages anyway.

So now you're asking what we need as the next-generation operating system? What's my ideal DOS? JD-DOS, if you please. I'd like to see MS-DOS recoded for speed and an ability to move beyond the 640K boundary. What about multitasking? It isn't important if the machine is fast. How many things do you really need to do at the same time?

So now you're asking what we need as the next generation operating system? What's my ideal DOS? JD-DOS, if you please. I'd like to see DOS recoded for speed and an ability to move beyond the 640K-byte boundary. Plus multitasking capability.

Plenty, it seems. People insist on hanging faxes and digital voice mailboxes and slow scanners on their machines, and I expect even-more-sluggish devices to appear in the future. So we need some multitasking capability. The machines now have the power to handle it. I also think a graphical interface might be nice *as an option*.

Basically, I've described OS/2. The difference is that OS/2 requires a megabyte (or two) of RAM and costs hundreds of dollars to buy. If it used a smaller code size and it ran old software in a multitasking mode and it sold for \$50, then you'd have JD-DOS.

As it now stands, OS/2 faces an uphill battle. The failure of *TopView*, *Windows*, Unix, and the long-forgotten CP/M-86 and UCSD p-System shows the staying power of plain-vanilla MS-DOS. Fans cite the 14 million installed PCs as a Rock of Gibraltar forever maintaining the viability of MS-DOS. Of course, something similar was said about the Model T.

As for the other also-rans and dubious alternatives, their chances of success are nil. The only other challengers are Wendin-DOS, a home-brew MS-DOS-compatible operating system with low profile and not much else; MOS-386, an operating system that isn't as compatible as it should be; THEOS, a totally incompatible operating system with nothing to offer that can't be matched or beaten by Xenix; Xenix, a Unix clone that shows no performance or appeal; and finally, a CP/M-86 offshoot, GEM, the enigma of all PC operating systems, finally relegated to running as a task under DOS. That's about it—not much to brag about.

One thing for sure: Microsoft wants somehow to move everyone into OS/2. And Microsoft may improve the code, modify the program, and give it away free to accomplish this goal. Until then, there is no reason to move to OS/2 or anything else. Without a compelling reason to change, nobody will change.

On the other hand, people don't like to be stuck in a dead end, and DOS is a dead end whether we like to admit it or not. Most systems are running with too many memory-resident programs and flaky device drivers, making it harder and harder to use new software without worrying about strange crashes. I have to rearrange programs listed in my CONFIG.SYS file to get many of them to work together. In this regard, DOS and its limitations are hurting the software industry. Too many software packages simply don't run on everyone's system, and DOS is much to blame for this.

Worse, the newest software requires more and more memory—which puts increased pressure on the 640K barrier, regardless of makeshift patches that expand usable memory.

For these reasons alone, it's apparent that the days of DOS are numbered. If DOS is being kept alive as a patched-up and bloated living-dead zombie, it's because of the alternatives—there are none.

John Dvorak, industry analyst, is a frequent contributor to PC Magazine, the San Francisco Examiner and MacUser.

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30	Prt Cost Accounting	01/22	15:15	1	STD	66	N	1	Y	77	1
25	Rdy Radiology Transcripts	01/23	18:24	1	STD	66	N	1	Y	2	2
6	Rdy Infection Control Report	01/22	15:02	5	STD	66	N	1	N	63	0
27	Rdy Emergency Room Schedule	01/23	20:10	5	STD	66	N	20	Y	2	1
30	Rdy *PRINTKEY	01/23	22:18	5	STD	66	N	1	Y	1	1
32	Rdy *COMMAND	02/10	19:23	5	STD	66	N	1	Y	1	1
28	Rdy Medicare Reimbursement	01/23	21:00	5	2pt	66	N	1	Y	26	0
26	Rdy Laboratory Reports	01/23	20:00	5	STD	66	N	2	N	2	2
24	Rdy Material Management	01/23	18:23	5	2pt	66	N	1	Y	2	2

Change spec. Delete. Exit. Hold. Pause. Release

resStart. View. Write. Queue select.

F1 Help F2 Reconfigure F3 Allow Printing

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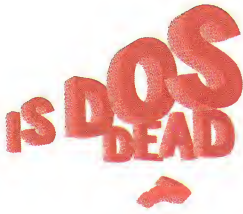
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▶ an exaggerated demise.

The first instruction in the gypsy cookbook for making chicken soup is supposedly: "1. Steal a chicken." The first instruction for millions of PC users thinking about using OS/2 is: "1. Sell your system and buy an AT or a Personal System/2."

OK, if you want to be picky about it, an alternative is to purchase a plug-in 286 card (or a whole new motherboard), three megs of pricey RAM, and a fancy new color display.

So let's say you decide to shell out the money for the right hardware, then plunk down a few hundred bucks more for OS/2 itself. What do you have then? For the next year or two, a beefier system, but not much else.

IBM: *But don't you want to be pioneers?* When DOS was first introduced, the joke was that you could always identify the pioneers, since they were the ones with arrows in their backs. IBM: *Oh, no. That's so...low-tech. We'll use bullets instead.*

Some users salivate over the prospect of executing all their applications simultaneously, switching instantly among them, and running the whole thing from a smart, flexible, intuitive interface.

But even if you do have an AT or PS/2, you'll run into problems. First, you'll have to buy OS/2 versions of your favorite software, then stuff even more RAM into your system to handle the increasingly bloated program code. Second, if companies like IBM and Microsoft are designing the interface, do you really think it has much chance of being even halfway smart, flexible, and intuitive?

And finally, do you really need all the claptrap and gimmickry? For most users, investing right now in OS/2 is like buying a stereo system with hundreds of buttons on it that say things like "Low-Pass Asymmetrical Negative Phase Modulation Woofer Boost Defeat" when all they want to do is play their scratchy old LPs.

Several years from now, when even the grubbiest clones all come with 386s and commodity-cheap 4-meg RAM chips, and Intel announces a processor codedign by Seymour Cray that has

to be dunked in a tank of liquid nitrogen so it doesn't melt your chassis, and software vendors finally figure out how multitasking can help the average user, everyone will give up DOS.

But these days, most users work on just one project at a time. If they have to export data from a decent spreadsheet into a decent word processor, they can do it. And if they need to pop up an appointment book, or a calculator, or a memo pad, DOS will let them. Several existing DOS programs already allow background communications. And if you haven't learned to save your work to disk periodically, and your system freezes and takes a day's work with it, consider it an expensive lesson.

Sure, DOS could be more elegant. It could provide a better way than TYPE or MORE commands to see what's in a file. It should allow more than 11 characters in a filename, and should prevent stupid mistakes like letting the COPY command wipe out a 100,000-byte file with a 10-byte file you've mistakenly given the same name. But that's what programs like PC/Computing's DIR-MAGIC are for.

In its place, IBM put a hefty and utterly incomprehensible hodgepodge of mumbo-jumbo on hot topics like using the "Latin America Convertible" keyboard or the "Portugal Enhanced PC."

Just switching to OS/2 isn't going to help the typical user one iota. A better bet is to read the more-helpful books and magazine articles on mastering the poorly documented features of the powerful DOS operating system they already use.

If you want to work more productively, you should also upgrade to the most recent edition of DOS; Version 3.3 adds important enhancements to many of the 2.1 commands and provides a slate of terrific new features. And don't forget about getting your hands on some of the power-packed DOS utilities like DIRMAGIC, or Charles Petzold's SWEEP, that provide many of the functions DOS forgot. And software is becoming more sophisticated (read: usable) by the minute.

—Paul Somerson

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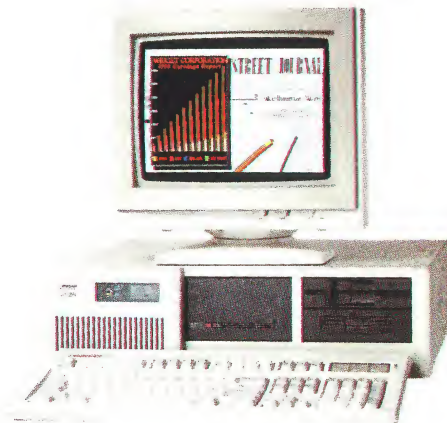


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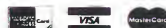
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By **BRUCE BROWN**

4 great low-cost laser printers

Price used to be one reason for not buying a laser printer. Now it's not really an obstacle. When laser printers were introduced four years ago, they cost \$3,500 and up. The original Hewlett-Packard LaserJet retailed for \$3,495. Today's HP LaserJet Series II printer, one of the LaserJet's descendants, has a list price of \$2,695 (it costs about \$1,000 less if purchased from a discounter), with more features, a higher page-per-minute (ppm) print speed, a smaller footprint, and easier operation.

Although the LaserJet Series II printer is far and away the current standard for low-cost laser printers, you can now buy a number of other good-quality laser printers for less than \$2,500 list price and \$1,500 street

quality and a dot matrix machine and spend under \$1,000—less than the street price of the least expensive laser printer. But you wouldn't get the laser's combination of quiet operation, speed, print quality, ability to print different fonts, and stunning graphics.

For not much more you can have all that—from a growing number of high-quality, low-cost laser printers, including the four reviewed here: the C. Itoh Jet-Setter II, the Okidata Laserline 6, the Ricoh PC Laser 6000, and the standard by which all the others are measured, the Hewlett-Packard LaserJet Series II. All but the HP list for under \$2,500, and all, including the HP, are generally available for up to 40 percent off list price.

Laser printers aren't always the best solution; they

can't print on continuous forms and don't handle ordinary adhesive labels well. The printers reviewed are designed to work with standard application software; they print reports, worksheets, correspondence, and so forth, but aren't suitable for

They deliver the same stunning graphics as more expensive models. But these printers are as fast, as quiet, and cost much less.

price (from mail-order houses and retail outfits).

Dot matrix printers (which generally sacrifice print quality for speed) start at less than \$200, but if they are built for heavy use and produce reasonably good print, they can cost from \$500 to \$1,200—and up to about \$2,000 if they're speed demons.

Low-end letter quality printers also retail for only a few hundred dollars. So you could buy both a letter

heavy desktop publishing because of memory limitations and the fact that they do not support PostScript (Aldus's powerful page description language).

Here's what the four printers offer and how they performed on our tests.

Bruce Brown is a principal of Soft Industries Corp., a Southington, Connecticut, computer consulting firm.

The C. Itoh JetSetter II (\$2,195) combines some of the best and worst features and performance of the machines tested.

It is the slowest, noisiest printer but produced the blackest black in the box-printing test.

The printer emulates the HP LaserJet Series II, with six fonts and 24 symbol sets, including the IBM graphics character set. But its method of changing print attributes (such as boldface) is the most awkward of all. You can choose whether to have the paper come out face up or face down, but you can't print envelopes.

Setting up the JetSetter II is simple. You drop an OPC (optical photoconductor) developer unit into the machine, and fill the toner tray. The paper tray attaches easily. Add paper, hook up the printer to a computer and you're ready to go.

The JetSetter II is the most expensive of the four printers to use, costing about 2 cents more per page than the HP LaserJet Series II. It is also noisy.

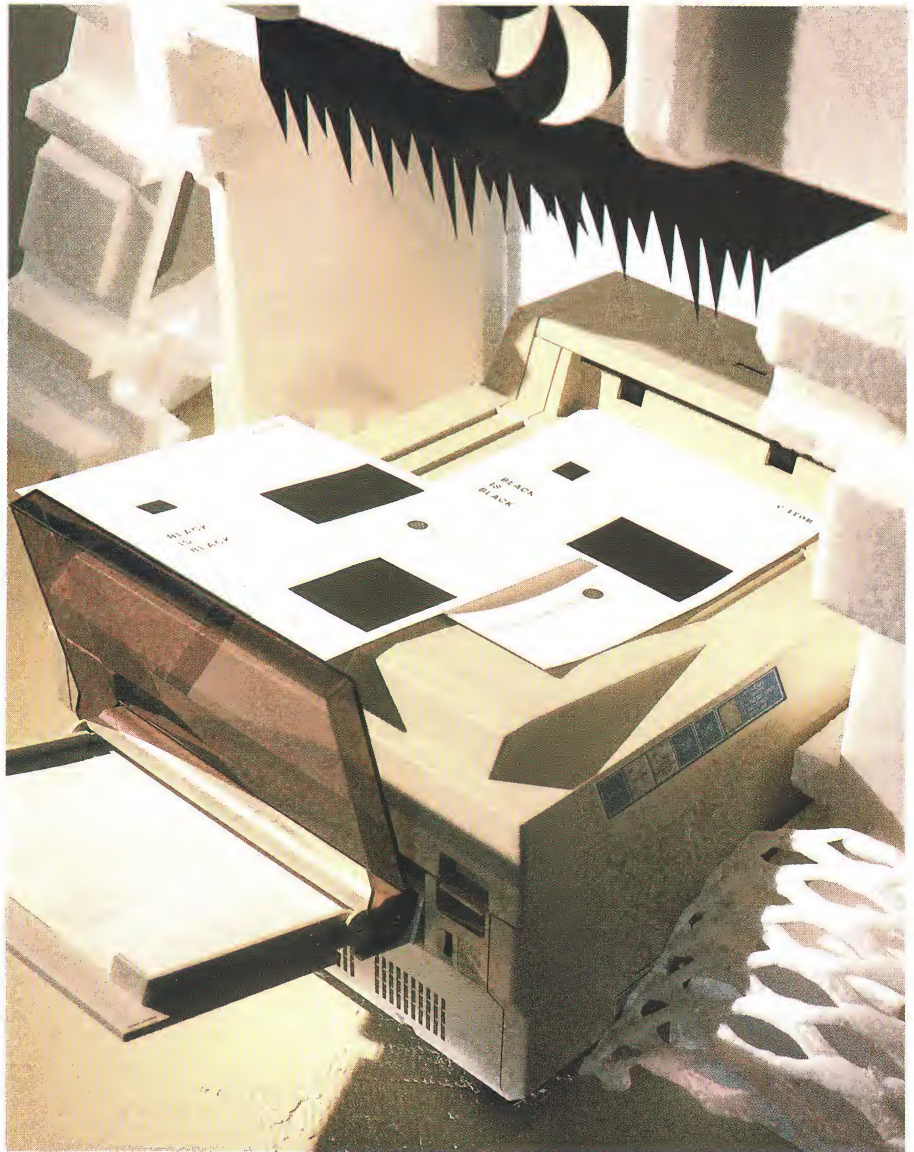
Changing settings requires considerable know-how and effort. The printer's control panel is similar to that of the original HP LaserJet; two buttons change on-/off-line status and perform a form feed or produce a test print. A single-character LED window gives simple error messages; two indicator lights warn you when the paper and the toner are out. On the plus side, using the simple dial on the back to adjust print density and the switch to set paper length is easy.

While programmers will have few problems controlling the JetSetter II, others may find it cumbersome to set up its escape sequence. One interesting function is the printer's ability to store up to 32 macros in memory at one time (in this case, a macro is a combination of printer settings that you can invoke with a simple escape code).

If you want to use more than the six fonts, you can download optional fonts or access them from font cartridges. In addition to turning in the best performance on the box-printing test, the JetSetter II produced crisp, dark print on the fonts test.

Slow and loud, the JetSetter II nevertheless prints well. But since it can't print envelopes, you should leave it on the shelf.

C. Itoh JetSetter II



List Price:	\$2,195
Other Costs:	Toner, \$69 for box of four containers, one every 1,250 pages (one box every 5,000 sheets); OPC Belt Cartridge, \$169, every 5,000 pages.
Per-sheet cost for 50,000 sheets:	Supplies, \$0.0456; printer and supplies, \$0.0895.
Per-sheet cost over design life of 180,000 sheets:	\$0.0578.
Emulations:	HP LaserJet Series II, Epson FX-80, and Diablo 630.
Resident Fonts:	Courier Medium, Courier Bold, and a 16.6-characters-per-inch Line Printer Medium font (both portrait and landscape); plus 24 symbol sets including the IBM graphics character set.
Memory:	512K RAM, expandable to 2MB for \$495.
Speed Test Results:	4.7059 ppm.
Print Density*:	Lightest, 1.47; darkest, 1.53.
*The results of our box-printing test, as measured by a densitometer, which assesses density of black on a logarithmic scale of 0 (white) to 2 (black). The human eye can detect differences of 0.1.	

C. Itoh Electronics Inc.
2505 McCabe Way
Irvine, CA 92714
(714) 660-1421

Okidata Laserline 6



List Price: \$2,145

Other Costs: Toner, \$29 every 1,500 sheets; cleaner magazine, \$89 every 10,000 sheets; OPC drum kit, \$199 every 20,000 pages.

Per-sheet cost for 50,000 sheets: Supplies, \$0.0309; printer and supplies, \$0.0738.

Per-sheet cost over design life of 180,000 sheets: \$0.0457.

Emulations: Diablo 630, Qume Sprint 5, Epson MX-80 with GrafTrax Plus, IBM Graphics Printer, and NEC 3550, 5510, and 7710 printers.

Resident Fonts: 15 fonts, including Courier, Courier Bold, Times Roman, Line Printer, and Helvetica in various styles and orientations.

Memory: 256K; a \$399 option increases it to 640K.

Speed Test Results: 5.7971 ppm.

Print Density*: Lightest, 1.40; darkest, 1.48.

*The results of our box-printing test, as measured by a densitometer, which assesses density of black on a logarithmic scale of 0 (white) to 2 (black). The human eye can detect differences of 0.1.

Okidata Corp.
532 Fellowship Rd.
Mount Laurel, NJ 08054
(800) 654-3282

At \$2,145, the Okidata Laserline 6 delivers a lot for a relatively low price. Its limited memory makes it better for standard printing than desktop publishing, but it has 15 resident fonts.

The printer's inner workings are the same as those of the Ricoh PC Laser 6000. The Okidata's Personality Modules are the major feature that sets it apart from Ricoh's offering.

Personality Modules are cartridges that determine both the Laserline 6's standard printer emulation and its communications interface. The model reviewed came with the HP LaserJet Plus Personality Module and a parallel interface—probably the most popular combination. Although the printer is not available with both serial and parallel interfaces on the same machine, it's still suitable for most purposes.

The Laserline 6's control panel has five buttons and a single-digit LED display. While you can send control codes via complicated escape codes from your computer, the easier method is to use printer control software like *LaserControl*, a program that's normally a \$150 option but comes free with the HP LaserJet Plus Personality Module.

LaserControl, which runs either as a standalone program or as a pop-up utility, adds printer emulations including Diablo 630, Qume Sprint 5, Epson MX-80 with GrafTrax Plus, IBM Graphics Printer, and the NEC 3550, 5510, and 7710 printers. It also makes it easy to define, save, and invoke style sheets for specific applications. The printer's paper tray lacks an adjustable paper width guide for the tray bed, but there is a width guide for the manual feed mechanism. You cannot print more than one envelope at a time.

The 15 resident fonts all print clearly. The Laserline 6's box-printing test looked somewhat better than the Ricoh's sample—more consistently dark. But it was not as good as that produced by the C. Itoh, the clear winner on that test.

Printer memory is the Laserline 6's weak spot. Currently, you cannot add memory above 640K—a limitation that rules out using this printer for serious desktop publishing. Nonetheless, the Laserline 6 is a good value.

The Ricoh PC Laser 6000 is a \$2,495 printer rated at 6 ppm. It comes standard with Diablo 630 emulation, eight resident fonts, and serial and parallel interfaces.

Setting up the Ricoh is easy and fast, taking only about 20 minutes. Once you've unpacked the unit, you add a toner cartridge and OPC magazine. The toner cartridge uses a small crank to roll up the toner release seal, an easier method than pulling paper and plastic strips as many other models require. Then attach the paper tray, load paper, and start it.

The 150-sheet paper tray has a paper release lever and paper width adjustments. You can feed sheets manually without removing the tray. The paper path is adjustable for either face-up, reverse-order sheets or face-down, collated-order sheets. Feeding envelopes either in a stack or manually, one at a time, is easy and works without jamming.

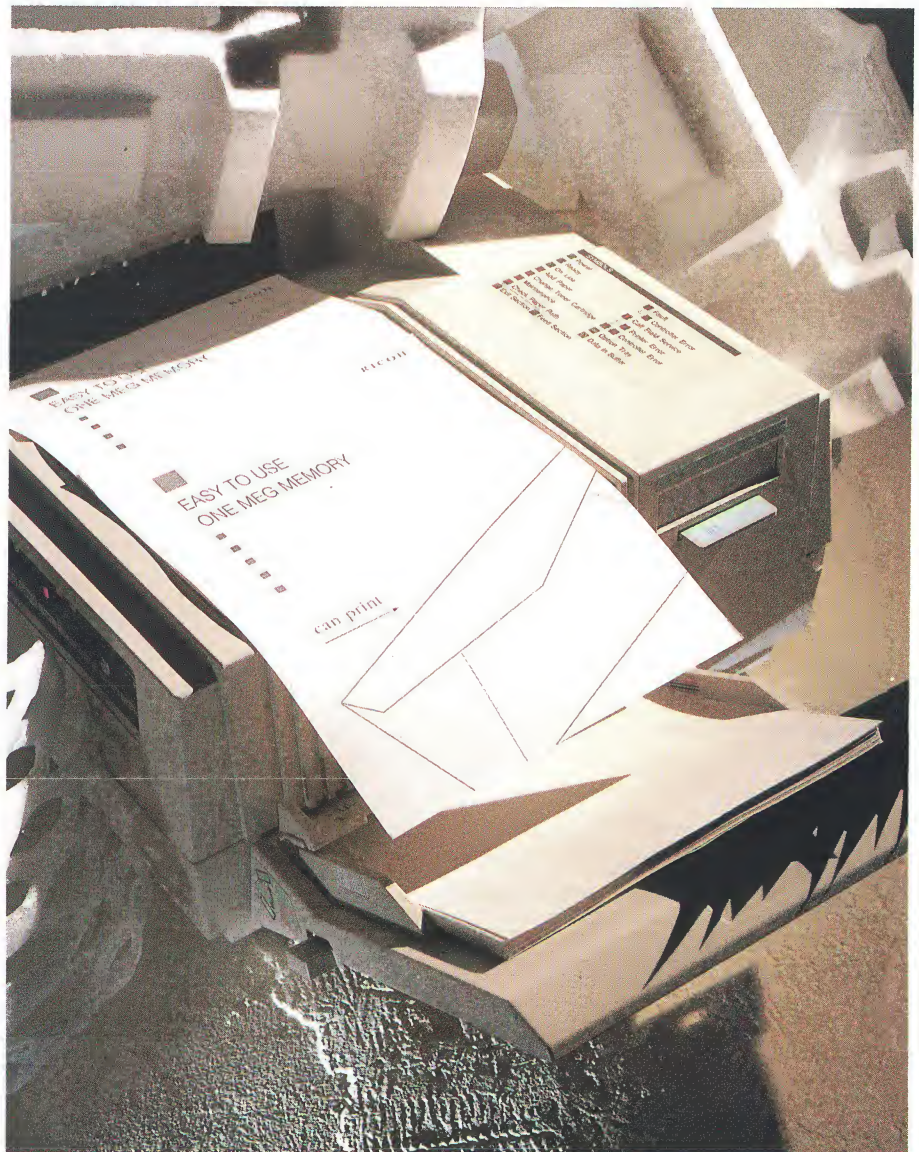
Setting printing parameters via the control panel is awkward at first. You can set character sets, print area, embedded codes, bit mapping, interface and controls, emulations, print orientation, auto wrapping, line height, character pitch, and fonts—all via two-character alphanumeric codes. The settings can apply for one session only or become the power-on defaults.

The clearly written user's manual has drawings to guide you in setting up and maintaining the printer. A quick reference card summarizes the control panel configuration and settings.

In addition to the standard Diablo 630 emulation, credit card-sized emulation cards slip into a slot in the printer. Proprietary font cartridges are also available at \$250 each.

The resident fonts produce good-looking type. Print quality on the box-printing test was marginal, though, with the black looking washed out toward the lower right-hand corner.

The Ricoh PC Laser 6000 is easy to set up and use, and performs respectably, but it's no great bargain. The limited emulation makes the additional \$99 for another emulation card almost a necessity—unless you plan to use the PC Laser 6000 only as a replacement for a letter quality printer.



List Price: \$2,495

Other Costs: Toner, \$29, approximately every 1,500 sheets; cleaner magazine, \$89, every 10,000 sheets; OPC cartridge (comes with new cleaner magazine as well), \$199, every 20,000 sheets.

Per-sheet cost for 50,000 sheets:

Supplies, \$0.0313; printer and supplies, \$0.0812.

Per-sheet cost over design life of 180,000 sheets:

\$0.0481.

Emulations:

Standard, Diablo 630; optional \$199 emulation cards, HP LaserJet Plus, Epson FX, and IBM Proprinter.

Resident Fonts:

Courier 10, Prestige Elite 12, Letter Gothic 15, and Century PS, all available in both landscape and portrait modes.

Memory:

1MB, expandable to 2MB in 512K increments (\$249 per 512K).

Speed Test Results:

5.8537 ppm.

Print Density*:

Lightest, 1.26; darkest, 1.48.

*The results of our box-printing test, as measured by a densitometer, which assesses density of black on a logarithmic scale of 0 (white) to 2 (black). The human eye can detect differences of 0.1.

Ricoh Corp.
3001 Orchard Pkwy.
San Jose, CA 95134
(408) 432-8800

Hewlett-Packard LaserJet Series II



- List Price:** \$2,695
Other Costs: Toner cartridge, \$125, every 4,000 sheets.
Per-sheet cost for 50,000 sheets: Supplies, \$0.0313; printer and supplies, \$0.0832.
Per-sheet cost over design life of 300,000 sheets: \$0.0399.
Emulations: None.
Resident Fonts: Courier, Courier Bold, and Line printer (both portrait and landscape).
Memory: 512K standard, expandable to 4.5MB.
Speed Test Results: 7.4534 ppm.
Print Density*: Lightest, 1.23; darkest, 1.37.

*The results of our box-printing test, as measured by a densitometer, which assesses density of black on a logarithmic scale of 0 (white) to 2 (black). The human eye can detect differences of 0.1.

Hewlett-Packard Co.
 3000 Hanover St.
 Palo Alto, CA 94304
 (800) 752-0900

The Hewlett-Packard LaserJet Series II printer is the current standard for laser printers, with the best combination of features and performance. Of the printers tested, the LaserJet costs more to buy (\$2,695) but less to use. The LaserJet is not the easiest machine to operate, though, and it does not emulate any other printers. But service is more widely available for this machine, and you can buy it for up to \$1,000 off list price.

The LaserJet Series II uses an 8 ppm-rated Canon laser engine with a 300,000-sheet design life. The paper tray holds 200 sheets, and paper output can be either face up or face down.

Unless you buy special optional paper trays, you have to feed the LaserJet Series II legal-sized paper and envelopes one at a time. Envelopes feed in just fine; the guide keeps them straight.

Standard fonts include Courier, Courier Bold, and Line Printer. Two slots can hold optional font cartridges, and more companies sell downloadable soft fonts for this machine than for any other.

The LaserJet Series II printer is the easiest of the four printers to set up. There's only one piece, the toner cartridge, to put in the unit.

The Getting Started manual covers setting up and configuring the printer. The User's Manual covers programming the unit. So far, so good, but the disappointment is that the HP LaserJet Series III printer command set will never win a prize for ease of use.

As for noise level, the printer is so quiet at rest that you wonder if it's on. Even when printing, it's quiet—even for a laser.

Front panel controls include eight pressure-sensitive buttons and a 16-character LCD display. Menu selections let you choose between resident features. While not a simple system, it's about as easy as laser printers get.

All resident fonts print clearly. The box-printing test produced consistent output, but not as dark as that of the C. Itoh, and the HP boxes showed horizontal lines.

The HP LaserJet Series II is a terrific buy. Its reliability, price, performance, and wide support by application software and third-party companies can't be beat. ■

► what to look for

Here are some factors and features to keep in mind when you shop for a laser printer.

Price

The printers are usually sold at hefty discounts, particularly the Hewlett-Packard and the Okidata. Check around for the best price.

Speed

The higher the speed the better, but real-life speeds are somewhat lower than manufacturers' ratings.

HP Compatibility

To take full advantage of a laser, you need to be able to work with lots of fonts and lots of software. Since the best-seller and the agreed standard is the HP LaserJet Series II printer, compatibility with that unit is a plus. There are several types of HP compatibility including command, downloadable font, and font cartridge compatibility; the more the better.

Printer Emulation

A laser's ability to act like other printers is another plus. The most standard printer emulations are the Epson FX-80 and the IBM Proprinter dot matrix printers and the Diablo 630 letter quality printer. A printer that was HP LaserJet Series II-compatible and could emulate these other printers would be eminently usable. Some printers have extra-cost "personality modules" or emulation cards.

Fonts

Font counts usually include both portrait (up and down) and landscape (sideways) versions of the same fonts, as well as different pitches, boldface, and italics. Extra fonts are available from font cartridges, cards, or chips and downloaded by software. The more fonts the better.

Memory

You'll need at least 512K memory. Memory in a laser printer stores optional font descriptions and serves as a page buffer when you send pages to the printer. Go for as much standard memory as possible. Adding memory later is expensive.

Paper Feed

The greater the capacity of the paper tray the better. A straight-through paper path has less chance of jamming than a curved path. Collated face-down output order is a time saver, but printers that can do it both ways, often by sliding a mechanical lever, often let you handle thicker paper stock. Try to get a separate envelope feed or adjustable guides that can accommodate envelopes.

Toner and Supplies

The easiest (and cleanest) printers to work with are those that have all replaceable supplies in a single toner cartridge. Also, look for a machine that doesn't require frequent toner changes.

Design Life and Duty Cycle

A printer's design life is its average expected life expectancy. Duty cycle, the number of copies per month, is often more important. Look for a long design life and hope to get many times more.

► deskjet: the cheapskate's gambit

There's no doubt about it: Sooner or later everybody will have a laser printer. But for many of us the high price still means "later." So what to do 'til our lasers come?

Spend a lot less money and get a Hewlett-Packard DeskJet.

The DeskJet is an ink jet printer, but forget everything you think you know about ink jets—the low print quality, the need for special paper, smears, fogs, and streaks. The DeskJet is a class act.

Its built-in Courier typeface is as good as that of a daisywheel printer, and with plug-in font cartridges it can do Times Roman or Helvetica almost as well as a laser. It is capable of resolution that matches lasers, 300 dots per inch. The quality difference comes down to what paper you use—the DeskJet's liquid ink doesn't stay put as well as laser toner, so on cheaper, rougher paper stock the characters tend to fuzz out.

It doesn't do PostScript, and its font cartridges aren't interchangeable with Hewlett-Packard's LaserJet. But for \$995 list (less at street prices), the small size of the unit, its quiet operation and most of all the quality of its output make it a here-and-now alternative to the lasers' sweet by-and-by.

—David DeJean

S T E P H E N

The author of *A Brief History of Time* remains one of the brightest minds of our time. Without the personal computer, we'd never know.

By CHARLES FOX

MAN FOR ALL TIME



PHOTOGRAPHS BY RED SAUNDERS

HAWKING

A high-backed electric wheelchair disappearing under a stone arch leading from the quadrangle of Gonville and Caius, Cambridge, was the first glimpse I had of Stephen Hawking, the 46-year-old British physicist described by his publisher as being "widely regarded as the most brilliant theoretical physicist since Einstein."

I followed through narrow, empty corridors and only caught up with the chair outside the freight elevator, in time to hear the electronic, synthesized voice say "Yes" to the young nurse facing him. They disappeared into the freight elevator. The rest of us waited our turn.

We came out into a reception room. It was carpeted in green, the walls were oak paneled, the far windows overlooked the summer-green University garden.

Hawking's electric wheelchair whined as it went into still another room. Again we followed.

This ancient room was hung with portraits of Elizabethan alumni of the college. Its wood floor was set with chairs for the conference. The atmosphere was hushed.

Hawking backed his chair up slightly to let mine pass. I went down the center aisle. I still had not glimpsed his face, but only got the impression of a slight, slumped figure.

Electronic media journalists were setting up, testing light and sound levels, whispering. Print journalists sat with notebooks poised.

When all was ready, the whine of Hawking's wheelchair came once more as he rolled slowly to the head of the class. He turned to face us with a squelch of tires.

He was a small figure, staring out at us through large, brown-rimmed spectacles on a narrow face. He wore a jacket and tie. His arms were crossed before him, his left hand operating the joystick of his wheelchair, his right the hand-switch for the computer and voice synthesizer. His legs, in slate-gray slacks, were flopped to one side. He gave us an inanimate smile. It seemed to cut across his face like the cut of a woodsman's axe.

"Can you hear me?" his electronic voice asked, in an American accent.

"Yes," we answered.

Charles Fox, novelist and journalist, is a contributor to such magazines as Harper's Bazaar and Automobile. Fox also works from a wheelchair.

I studied the oil portrait of a woman wearing a ruff, and wondered at the other events that had occurred in this room. None like this, I guaranteed myself.

"Ladies and gentlemen," the voice went on, "this may be the first time you have been addressed by someone using a computer. I hope you will agree my voice is clear and easy to understand. The only trouble is my American accent, but the company is working on a British version . . ."

He went on to explain about his disease and how he lost his voice. Then he said that the synthesizer he was using was by far the best he had heard, and that he was pleased his book had aroused interest. He hoped it might show that disabled people can achieve success with the right help and equipment.

"But I'm a scientist...not a pop star," he said. "I have some very exciting research on baby universes, and by holding this press conference and answering questions, I hope to get a bit of time for my research."

He opened the floor for questions.

An unidentified man asked, "You deal with complex ideas—do you feel you are able to put them down completely?"

The silence lasted several minutes, interrupted only by the clicking of his computer. We sat once more as if in church. Without warning, the metallic voice interrupted.

"I think I can do that just as well as anyone else. I can write equations on a program called *T_EX* (see sidebar). I write equations in words and the program translates them into symbols."

"Professor," asked another questioner, "how long do you expect to carry on, and what do you expect to be able to achieve in that time?"

Hawking began quietly squeezing the switch in his hand to generate his response. A middle-aged, blond woman seated behind me whispered to me that her name was Judy Fella and that she had been Professor Hawking's personal assistant since 1975.

As Hawking stared at the screen mounted on the arm of his wheelchair, Fella said that his condition had not really changed that much. He usually got a bad cold every January that worried her sick. In 1985 he had caught pneumonia while traveling in Switzerland, and it cost him his voice. After that, Fella whispered, he had nurses looking after him around the clock and she be-

came their supervisor.

Fella used to translate for him. She was one of the last who could understand him. One of his students would feed him lunch, and a nurse would come only to put him to bed and get him up.

"Before he lost his voice," Fella whispered, as the professor prepared his answer, "he depended more on us. When he lost his voice, he thought it was going to be the end of something In fact, it's become a whole new era for him."

"But we don't see him as much. He's more independent now that he can speak for himself, and his nurses feed him."

Hawking answered, "For the past 25 years, I have lived with the possibility of an early death. But I'm still here. I don't look too far ahead."

Another questioner asked, "In your own view, where does science end and religious faith start?"

I asked Fella, "All this nursing must cost a lot. Who funds the professor?"

"Well, some Americans have done it for a long time," she whispered. "Ask him—don't be afraid to ask him anything. He's just an ordinary person, you know. He gets up about eight o'clock, if he's not off somewhere. Then he'll have a bath, have his breakfast, get on his wheelchair, and go to his office. It's only about a quarter of a mile down the street from his house. I suppose it takes him about an hour to get up and to go to bed."

"Does he get tired in the afternoon?" I whispered.

"I can usually tell when he does," Fella said. "He gets very pale. He looks in good form today, though, doesn't he?"

"Does he have much physiotherapy?"

Fella nodded. "He can move certain limbs, but he is very weak. You'd better ask him about that."

"You see, I never see him as being this wonderful

vation. Since I have not had any revelations, I have to rely on science."

"Do you think your cosmology," a German journalist asked, "will help in the resolution of such problems as the nature of God or the origin of the universe? Or do you think these things will always remain a mystery? And if you have a philosophy, how do you define it? Idealistic, maybe?"

A smile fell upon Hawking's face, resting there a moment or two before he began to twitch his finger, selecting and spelling out words for the computer to utter.

Behind me, Fella whispered, "I had to type a lot of boring papers for him. He taught me how to use a word processor."

We began writing his book together about four years ago," she said. "I told him, 'Just write it so I can understand it and you'll be alright. Everybody will understand it then.' " She giggled.

Hawking's synthesized voice interrupted: "The philosophers got left behind in these questions. I see no reason why science should not be able to explain how the universe began."

Someone posed another question about mankind and the origin of the universe, but I was unable to catch it. Fella had begun telling me about Hawking's children.

"There's Robert, the eldest. He's studying math at Cambridge. Then there's Lucy. She's 17. She's absolutely super. She's studying for her A levels here in Cambridge. Then there's Timmy. He's eight, I think."

She was still talking about his children when the voice intoned: "There are people working on these questions. We are making remarkable progress towards understanding the universe. That is why I wrote my book, to explain these incredible discoveries to the general public."

A woman asked, "How do you feel about being compared with Einstein?"

I whispered to Fella, "Can you give me an example of one of his jokes?"

She grinned and said, "No comment."

In the silence, the electronic journalists were tiptoeing to the front to get close-ups of Hawking.

"Is he a religious man?"

She shrugged. "You'll have to ask him that yourself," she whispered. "He'll tell you that 'God doesn't play dice with the universe.' "

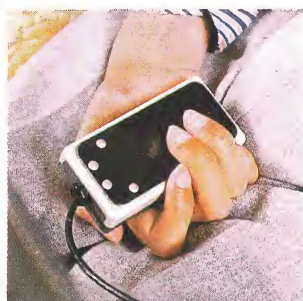
This was Einstein's phrase, to explain why he rejected quantum theory, which allows for randomness in the behavior of subatomic particles. Considering Hawking's familiarity with quantum theory, I had assumed his answer would be the opposite of Einstein's.

The electronic voice broke in, "It's media hype. I'm a bit smarter than most, but not exceptional."

There were no more questions. The conference had lasted exactly 45 minutes.

"Let's take some tea," Hawking said from the corner of the room.

We decamped to the tea room. I encountered Hawk-



"When he lost his voice, he thought it was going to be the end of something . . . In fact, it's become a whole new era for him."

brain. To me he's just Stephen.

"He's just got this wonderful, wonderful sense of humor. In all the years and all the difficulties he's been through I've never, never, never once heard him complain. That's what I admire him for. Not his work, because I don't understand a thing about black holes."

Hawking's monotone electronic voice gave the questioner his answer, "I don't think there is a dividing line. They're both trying to explain the universe, but religion is based on revelation, while science is based on obser-

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ing face to face, chair to chair. I introduced myself.

"I haven't had time to write answers to your questions," he told me. "Let's take some tea."

We wheeled our separate ways.

I was beginning to wonder if Hawking, despite all the adversity he had come through, was still no more than a hard-nosed, mathematical physicist.

He had agreed to meet with me the following afternoon at the Department of Applied Mathematics and Theoretical Physics on Silver Street. I would then have my chance, perhaps, to decide.

I first learned of Hawking years ago when I read about his work investigating black holes in space. There were photographs of him looking tousled and gaunt, his large eyes optimistic despite the fact that he was doomed.

I remember the gist of his words. They travel with me ever after: "Since I can't talk very well anymore or write much, I have tried to concentrate my thinking more. I sometimes go into the bathroom and turn out the light to escape the world and think."

He was making a virtue out of his disability. I liked that. Having a disability myself, I was inspired, when I had been afraid.

Hawking clearly made his home in the universe, unafraid to go anywhere, think anything. I was determined to allow his principle of economy to shape my work. I carried his word in me across the years as things became more difficult.

I heard no more of him, and assumed he was dead, since his disease, ALS (amyotrophic lateral sclerosis, known in America as Lou Gehrig's disease), is usually fatal within five years.

But this May the editors of *PC/Computing* asked me to go to Cambridge and interview Hawking.

He was now 46, holder of Sir Isaac Newton's chair as Lucasian Professor of Mathematics at Cambridge University. He had described his just-published book, *A Brief History of Time—From the Big Bang to Black Holes*, as a "popular book about space and time."

It would not be an easy story. I know nothing about Hawking's field, the interview was scheduled to take place only 48 hours before the deadline, and Hawking can no longer speak.

Three years ago he got pneumonia, the dread of every quadriplegic with the will to live. He was saved by a tracheotomy, at the expense of his voice.

Hawking is one of a handful of people searching for the Grand Unification, a theory linking relativity and quantum mechanics—a theory Einstein sought for years in vain.

Tim Ferris, a respected cosmology watcher, says of Hawking, "Even if he didn't have ALS, he would be one of the greatest theoretical physicists of our time," acknowledging the mystique of Hawking's disease. As with any fatal, slow-acting disease, its progress has a subtle fascination for both sufferer and onlooker.

Hawking was 21 years old and a graduate student at

Oxford University when he was diagnosed. He had been a cavalier student, and now with a prognosis of two years of life remaining, he took to drink.

"There didn't seem much point to going on," he says in his book.

Love saved him.

"... two years later... I was not much worse," he continues. "In fact, things were going rather well for me and I had gotten engaged to a very nice girl, Jane Wilde. But in order to get married, I needed to get a job, and in



**The new Einstein?
The electronic
voice broke in.
"It's media hype,"
said Hawking.
"I'm a bit smarter
than most, but
not exceptional!"**

order to get a job I needed to get a Ph.D."

Professor Dennis Sciama was Hawking's Ph.D. supervisor. "I didn't need to guide him," Sciama says. "He was pretty independent from the beginning."

Sciama recalls how Hawking joked that Cambridge would accept him only if he got a first (highest honors) at Oxford and that he was sure to get one if Oxford got tired of him acting the cavalier.

Once when Sciama returned to the laboratory after dinner, he turned on the light and discovered Hawking, who was having difficulty walking, waiting for help, in the dark, at the head of the stairs. Hawking had been there an hour or two, but was quite unperturbed.

The difficulties imposed by Hawking's disease hold implications that go beyond walking down stairs.

Sciama notes, "To do high-level physics, you have to do complicated mathematical calculations. If you can't even write, it presents problems.

"Hawking's mechanical difficulties have led him, on the whole, to try and solve problems of an overall kind, problems that don't need extremely detailed calculations that he must either get a student to do or carry in his head.

"His book is a good example of the way he has allowed his disability to compress his thinking. It has a very succinct style. It's all there, not a word wasted. Just as in his theoretical work."

After Hawking earned his Ph.D., he began to work with Oxford physicist Roger Penrose.

"When I first met Stephen, in 1965, I didn't know there was anything wrong with him," Penrose says. "He was a very affable and quick-witted man."

Penrose had shown that a star collapsing under its own gravity is trapped in a region whose surface of entry shrinks to zero size, zero volume. So the density of matter and the curvature of space-time become infinite.

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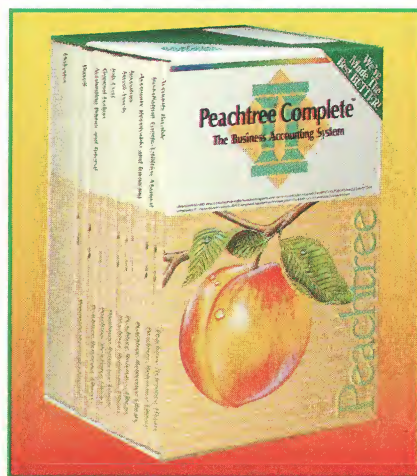
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*InfoWorld, December 1987.

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► thoughts into words

How can a man run a computer when he has lost all but the barely perceptible movement of a finger? Tapping out Morse code on a switch?

Stephen Hawking uses the switch but not the Morse code. The switch operates the Words+ *Equalizer* program from California-based Words+ Inc., which opens the universe of PCs to the brilliant physicist via "bimodal scanning of a two-dimensional menu."

That may sound like a theory Hawking left out of *A Brief History of Time* because it involved too many formulas. But it's actually an elegant way for him to choose the words and commands he needs to speak through a synthesizer, run a word processor, or play chess.

Think of the way you choose items from the single column of a program menu. Now, add more columns and imagine the computer scanning the menu for you, and you'll understand how Hawking talks and works.

Ordinary programs let you choose a menu item by pressing an arrow key, which moves a selection bar on the screen. When your choice is highlighted, you press the Enter key.

The *Equalizer* program moves the selection bar for you. All you have to do is click a switch when the menu you want

is highlighted. The switch can be activated by pressing it with a finger (like Hawking does) or, using Words+'s infrared switch, with as little as the blink of an eye (see illustration).

You're halfway there. *Equalizer* presents a menu of word choices the same way a spreadsheet presents numbers—in two dimensions, with choices identified by row and column. The software scans the rows by moving a horizontal highlight bar repeatedly from the top row to the bottom.

To choose a particular option, you begin by clicking the switch when the screenwide selection bar highlights it (along with the other options in the row). The horizontal bar changes to a vertical bar, and the top-to-bottom scan becomes left-to-right. Now all you have to do is press the switch when your choice is highlighted again by the column-selection bar.

Equalizer is actually a touch more complicated—and powerful—than that. Before you choose row and column, you must choose between two 2-dimensional menus. The bottom one lists the 36 most common words in the English language, which account for 40 percent of all spoken English, according to Walt Woltosz, who wrote *Equalizer*.

The top menu contains some commands and punctuation, but mostly the letters of the alphabet, which index the rest of the software's vocabulary. Choosing T, for example, brings up a screenful of the most common words that begin with T, and the row-by-column scan begins again.

When a word is chosen, *Equalizer* presents the six words it thinks you're most likely to want next. The suggestions are based on the last six times you used the base word. (That approach works because the words you pair depend more on the subject you're discussing than on word counts of all the discussions you've ever had.)

Walt Woltosz, who wrote *Equalizer*, says the program's 2,000-word vocabulary, supplemented by up to 600 words the user can add, is enough even for an incredible intellect like Hawking.

Woltosz has already expanded and customized the vocabulary for Hawking. Some letters have to be grouped to get all 26 to fit their section of *Equalizer*'s main menu screen. In the standard version, one grouping is P and Q. Since P comes first, words beginning with Q were relegated to the far rows and columns, an inconvenience for Hawking, who frequently uses the words *quark* and *quantum*. So, Woltosz combined Q with R on Hawking's main menu, which put the Q words first.

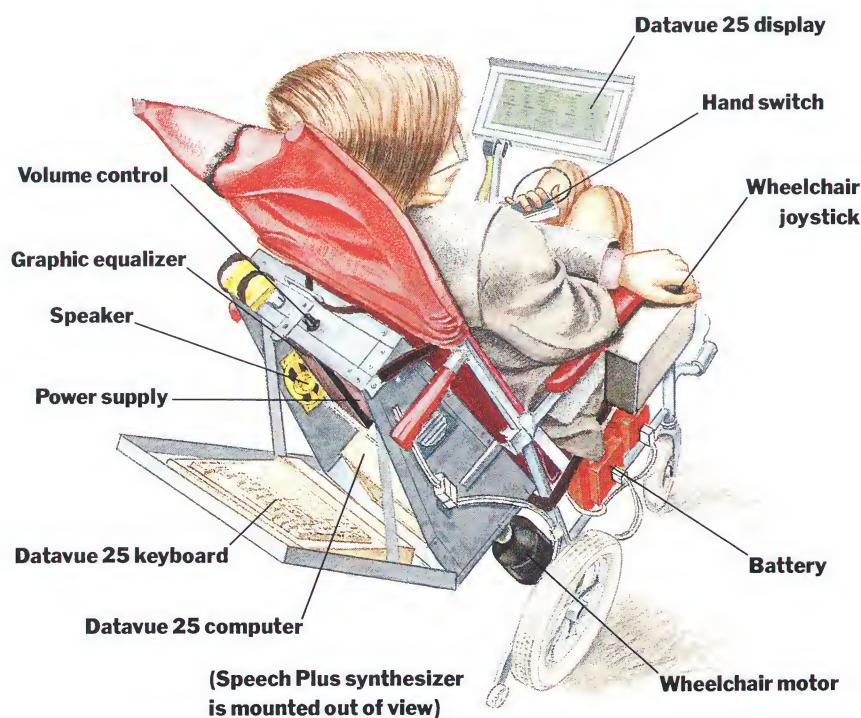
For Hawking's academic writing, which requires Greek characters and special symbols that *Equalizer* cannot handle, Hawking uses a keyboard emulation program from Words+, which presents the keys of a standard PC keyboard using the same scan method.

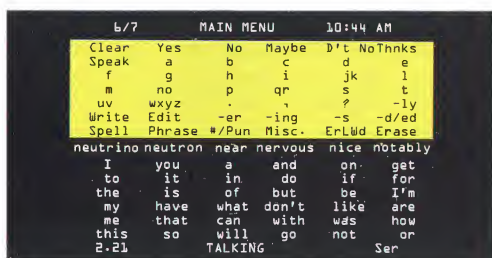
Hawking is exceptionally quick on the switch and can compose 15 to 20 words a minute with *Equalizer*. He can save his writing to a file or send it to the Speech Plus synthesizer mounted on the back of his wheelchair. His only complaint is that the synthesizer has an American accent.

On the other hand, Hawking probably won't switch even when British Telecom finishes its synthesizer with a proper British clip. When Speech Plus gave him its latest upgrade, Hawking objected.

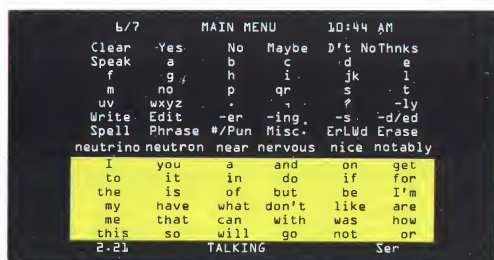
That wasn't his voice, Hawking said, and he wanted his old voice back.

— Kevin Strehlo

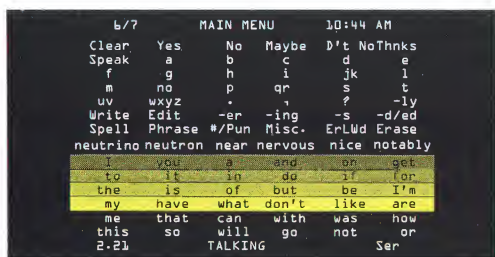




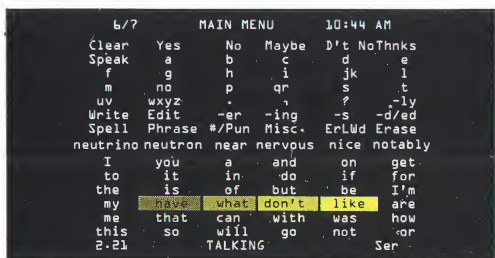
1. The selector highlights the top half of the screen at the beginning of the scan cycle. If Hawking wishes to choose a command, or if he wishes to see a list of words beginning with a particular letter, he must click now. He waits.



2. The selector shifts to the list of the 36 most common words in spoken English on the bottom of the screen. Hawking clicks now, because he wants to choose "like" from the list.



3. With the bottom half of the screen selected, the selector shrinks to highlight just a row at a time and begins to march down. Hawking's eyes are watching "like," and he clicks when the selector reaches it.



4. Hawking continues to watch "like" as the selector, now highlighting only a word at a time, moves from left to right. When it reaches "like," he clicks. He has built the first word of a sentence, and the software presents the six words he is most likely to want next.

In other words, there is a singularity in the region of space-time known as a black hole.

"Hawking approved of my theory," Penrose says, "and we then wrote a paper together. I understood him perfectly when he spoke to me technically, but then he'd say something else and I wouldn't understand at all. So I'd get him to write it out and it would be a joke—the point by then completely lost."

Their work together extrapolated singularity to the big bang theory, showing that the universe began from a single point.

"We used Einstein's classical theory of relativity," Penrose says.

Hawking, alone, then took

this work and showed that particles at the event horizon, or mouth, of a black hole might emit what became known as Hawking's radiation. Hawking thus combined relativity and quantum mechanics in a major step toward the fabled Grand Unification theory.

"We shouldn't get too carried away with him being closer than anyone to discovering the Unifying Principle," Penrose says. "It's a matter of opinion at the moment. He has some interesting ideas; so do some other people."

Sciama says Hawking would disavow any comparison with Einstein. "He's certainly great, but if you forget about the disability, there are others alive who are his equal or arguably better."

As Hawking's work progressed, so did his disease. But the basic research on quantum mechanics done by earlier theoretical physicists such as Niels Bohr and Werner Heisenberg is paying off, making possible the microchip and minicomputer that allows Hawking to stay in touch with the world, as he increasingly becomes a prisoner of his own nervous system.

The time had come to talk with Hawking himself.

The department of Applied Mathematics and Theoretical Physics at Gonville and Caius is a dreary, box-like building. Hawking has his own ramped entrance and a small office off the common room.

One wall was hung with blackboards, formulas chalked on them. On the opposite wall were three long shelves of books like *Three Hundred Years of Gravity*. Against these leaned a photograph of Einstein and of Hawking's wife and children, a framed Gary Larson cartoon depicting Hawking, a black-and-white photograph of Hawking with Soviet dissident Andrei Sakharov, and, on the back of the office door, a color poster of Marilyn Monroe.

On Hawking's desk was an IBM PC with a color monitor. Hawking wheeled his chair into place behind the desk, and his nurse put the control in his hand.

Our photographer, Red Saunders, started to shoot.

Hawking was impatient. His computer clicked. The metallic voice said, "I thought this interview was going to be about computers, not God."

I was thrown.

I asked him what his views were on the current use of

the personal computer.

The silence was disturbed by the clicking of his computer and the flash and whirl of Red's camera. We were all uncomfortable.

Hawking's answer was that we needed a lightweight computer, rechargeable, with 12-hour batteries. And cheap.

I asked him what he saw in the future for the personal computer. He said he needed more disk space and memory. He then demonstrated his synthesizer, playing for us the different voices.

He asked Red, "Are the photographs finished?" Red was sweating.

I tried to lighten things by saying that chess master Bobby Fisher had complained that the trouble with playing chess against computers was that they didn't know when to resign. I asked Hawking whether cosmologists had any such complaint.

He ignored the question.

"The reason I agreed to meet with you," he said, "was because I thought it would help other disabled people."

I told him I had formed quite an attachment to my computer. I said I felt nude without it and tended to anthropomorphize it.

He said, "I'm never away from my computer. If I were, I wouldn't be able to communicate. Computers are just machines."

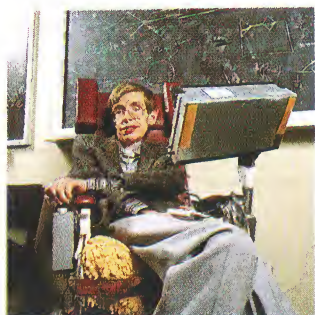
I decided to ask him anyway. I said, "Given that mind is the principal tool with which you work, what is its nature?"

I waited as his computer clicked.

At last the voice said, "What is mind? How could we tell if a computer has a mind?"

"Is mind not that with which we think?"

"I thought that was the brain."



His computer clicked. The metallic voice said, "I thought this interview was going to be about computers, not God."

"The brain is what's left when the current is turned off," I said.

The smile appeared on his face. It was impossible to tell what lay behind it. He began to cough through the tube in his throat. He was slumped down in his chair. The voice said, "Can I have a lift?"

His nurse, who was sitting on the floor behind the desk reading a novel, came to him, and he asked if we'd leave the room.

Saunders and I went out into the common room and

had tea. The room, though not crowded, was abuzz with talk of physics. Hawking eventually appeared, and wheeled over to join some friends.

When I rejoined Hawking in his office, Red had taken his gear and left. Hawking's secretary, Sue Masey, came in and handed us an advance copy of the June 13 issue of *Newsweek* with Hawking's picture on the cover. The headline read "Master of the Universe."

His book had made the best-seller list, and he was the flavor of the week. An editor from Bantam Books called from New York, and a long conversation ensued.

When it was over I asked, "What is the nature of reality?"

He was slumped in his chair, head lolled to one side, thin legs crossed. I drew my chair up beside his and watched his words appear on the screen, one by one. "People have wasted a lot of time on that question with rather little result."

"Do you play hunches?"

His words clicked out, "All the time."

"Don't these hunches arise out of a concept of reality based on your experience of it?"

"What I do is make mathematical models. These models exist in our lives. It doesn't make any sense to ask if they are real, because there is no way you can test that."

"So the essential sustenance for you is the rigor of your discipline?"

"No."

"But when people try and question you in areas outside your discipline, it seems you guide them back in."

"I occupy myself with meaningful questions. I don't think 'What is the nature of reality?' is one."

"Then, does understanding the theories of theoretical physics require a shift of perception? Is that what makes them difficult to understand?"

"Understanding new models of reality often requires a shift of view. Scientists are no better than anyone else at adopting a new point of view. It gets more difficult as you get older."

"You say in your book that Newton was worried about the lack of absolute space because it did not accord with his idea of an absolute God. I've wondered if anything similar troubles you?"

"I like the idea of a self-contained universe, but maybe that's just my anti-religious prejudice."

I thought of the papal persecution of Galileo Galilei, the anti-Semitic persecution of Einstein—of all the fear passed off as religion that has encumbered the thinking of such people. I said, "Your use of the word *anti* surprises me, because in talking to people around you I see you are a compassionate man."

"Are they incompatible?" he asked. "I feel that compassionate individuals embrace what they will. I don't think that affects whether you believe in a personal God."

"Does belief in a God external to ourselves create a duality from which understanding a unified universe is



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impossible?" I asked.

"If belief in the universe is governed by scientific laws, you don't believe in a God that intervenes." He stood behind the scientific principle, not, I perceived, as a man who believes one thing rather than another, but as a man who stands behind a tree to shield himself from being shot.

"What is the relationship," I asked him, "between who you are and what you do?"

He answered, "One is who one is because of what one does."

I thanked him for his time and for the inspiration he had been and then congratulated him on having written a good book. His nurse put his thumbprint on the fly-leaf of my copy.

We said goodbye. I left him there, behind his desk, behind his computer, beside his nurse.

The common room was empty now. Outside, it was dusk and light rain had begun to fall as we went along the narrow streets of Cambridge.

I felt a certain regret leaving him. He had written, "The progress of the human race in understanding the universe has established a small corner of order in an

increasingly disordered universe." Into this increasing disorder we regretfully went.

Hawking's words stayed with me.


"One is what one is because of what one does."



I asked him the relationship between who he is and what he does. He answered, "One is who one is because of what one does."

I thought on the manner in which he is, which is of greater significance than what he does—for undoubtedly it is more difficult to be as Hawking is than to think as he does. ■

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HOW TO MAKE
ACCOUNTING SOFTWARE
WORK FOR YOU

By **KATE AMBROSE BROWN**



ou won't want to fire your CPA firm, but today's easy-to-use accounting software can help you cut costs while keeping the books straight. Better yet, management stands to accumulate real gains from the reports generated by accounting programs.

The best of today's accounting software makes it easy to handle general ledger, accounts receivable and payable, inventory, payroll, and more via the PC. Many of the programs also let you generate valuable reports—both formal and ad hoc—to help you run your shop at the level of your strongest competitors.

You don't have to assign a CPA or a computer expert, nor be one yourself, to use an accounting package. And where you once had to spend thousands, now a couple of hundred dollars buys a high-quality program.

Accounting software can make handling the books easier than ever. But you'll need to do some planning to select a package that fits your needs, and you'll probably have to make minor changes in your existing accounting routine as you convert to a computerized system.

To begin with, make sure you have the right hardware: at least a 10-megabyte hard disk.

When shopping for a package, give the vendors as much information about your needs as you can. Ask your accountant to submit a list of accounting department needs, while you supply the management reporting needs.

Some accounting packages are sold as complete integrated systems that include various combinations of general ledger, accounts receivable, accounts payable, invoicing, payroll, inventory, fixed assets, and job cost modules. Others are sold module by module. If you buy a modular package, make sure that you can automatically transfer data among modules.

Convert the system one module at a time. It's a good idea to start with the general ledger and then add accounts payable, followed by accounts receivable and other functions. Run the computerized accounting systems parallel with your manual system for at least three months.

The program you select must be able to handle the types of accounts you maintain and the format of your vendor and customer information. If the chart of accounts requires subdivisions to track job codes within departments and the package you're considering doesn't allow them, look somewhere else.

Make sure your package can import and export data and produce the reports you need. Most accounting programs offer standard balance sheets, income statements, trial balances, aging reports, customer and vendor listings, and other reports. But report formats are often predefined; the information may not be in a format that suits your company.

If you want to create custom reports, the program must be able to transfer data to a spreadsheet or a programmable database. The spreadsheet analysis will come in handy for forecasting too. The better packages let you output selected data to a spreadsheet or database, but lower-priced packages may require an extra utility program to export part of a file.

Other important features are an automatic interface among modules, as well as the ability to handle partial transactions. An accounting package should let you maintain adequate historical information on customer and vendor transactions, edit data easily, accommodate recurring entries, retrieve information for any range of dates or periods, and monitor budgets and cash flow. In addition, it should give you control totals and control reports, so you can check whether information has been entered correctly.

Although experience at a Big Eight accounting firm is not essential, some training time is. Most programs shorten the learning curve with tutorials and sample data files.

At \$49.95, Intuit Software's *Quicken* may be all the accounting software you need. A slick program that

CASH FLOW FORECAST BY WEEK						
8/21/88 Through 10/ 4/88						
1STBANK 6/ 4/88						
Date	Num	Payee	Memo	Clr	Pmt/Dep	
8/23	*****	Acme Supply	Materials	Invoice # 42658	-15,276.82	
8/26	INCOM	Sampson Steel Co.	Revenue		12,000.00	
TOTAL 8/21/88 - 8/27/88					35,373.29	
BALANCE 8/27/88					35,373.29	
8/29	*****	Boston Labs	R&D Project X73		-14,500.00	
8/30	*****	Western Bell	Utilities	WATS bill	-7,142.67	
TOTAL 8/28/88 - 9/ 3/88					-21,642.67	
BALANCE 9/ 3/88					13,730.62	
1STBANK						
Esc-Create Transaction Report				F1-Help	F5-Print	

Despite the fact that it's easy to use and low-priced, Quicken gives you a variety of management reports.

You don't need a CPA to use an accounting package. Today, a couple of hundred dollars buys a high-quality program.

started out as an automated checkbook and check writer, it also does many of the things "real" accounting packages do—automatic budget, income, and expense reports (both on-screen and printed), 1-2-3 data transfer, complete tax and payroll record-keeping, fast location of transactions, multiple categorizations, and transaction splitting—with less effort.

The main drawback of *Quicken* is that, like your checkbook, it's a single-entry program. Double-entry programs, like the others mentioned here, enter each of your transactions in at least two places, which balance each other out. So when a cash-based business pays a bill, double-entry programs debit the expense account and credit the cash account.

For a double-entry package that's adept at exporting to a spreadsheet, try *Peachtree Complete II: The Business Accounting System* with the *Peachtree Data Query II* (PDQ II) report writing/file export option.

Especially if you have some accounting experience, this capable program will impress you. The recent price cut from \$4,800 to \$199, as well as significant improvements in this version, make the *Peachtree* package even more impressive.

Tutorials supported by real-world sample data show you how to use the integrated modules, which include general ledger, accounts payable, accounts receivable, invoicing, inventory, payroll, fixed assets, and job costing.

Peachtree Complete II uses windows and pop-up menus. Help screens are available, but they could be more extensive. You can choose the period and range of accounts, customers, vendors, and so forth that you want to include in a report. To troubleshoot data entry, you can use optional control reports and audit trails.

With more than 450 reports to choose from, the program's reporting is adequate. But you'll need *PDQ II*, a separate \$199 package, to transfer data to a spreadsheet program for creating additional, custom reports.

With a minimum of 640 Kilobytes, you can run *PDQ II* as a memory-resident utility. It lets you transfer a specific part of a specific file to, say, a *Lotus 1-2-3* file. *PDQ II* shows you an on-screen view of the file, from which you can choose the fields you want to transfer.

The Options menu lets you narrow your conditions. You can select, for example, customers who have a balance of more than \$50,000. You won't need to write Boolean equations to do the search; it's all menu-driven, and only the data you need is output to the file. You simply load the file into a *Lotus* spreadsheet, using 1-2-3's File/Import function.

Once you've established a procedure, you can store it

The screenshot shows a DOS-style window titled "PDQ II". At the top, there are three boxes: "DISPLAY" with options LIST, GRAPH, REPORT, and TRANSFER (selected); "Select Output Format:" with options LOTUS (selected), MultiPlan, DIF, and ASCII; and "Enter Output File Name:" with the text MYFILE. Below these is a table of fields to be transferred:

VENDOR-ID	VENDOR-ADDRESS-3	INVOICE-DATE
VENDOR-NAME	POSTAL-CODE	FED-ID-NUMBER
VENDOR-ADDRESS-1	TELEPHONE	TRANS-TYPE
VENDOR-ADDRESS-2	INVOICE-NUMBER	CURRENT-BALANCE

Below the table is a "more" button. At the bottom, a command line shows "Command: TRANSFER TO LOTUS FILE MYFILE.wks". A status bar at the very bottom says "F1 Help".

With the help of the optional PDQ II module, Peachtree Complete II can export selected data to 1-2-3 spreadsheets.

in *PDQ II* and run it again as needed. In fact, *PDQ* comes with dozens of predefined procedures. Two of the most popular are Sales Analysis by Customer and Sales Analysis by Product.

Attention, 1-2-3 users: some packages offer only plain ASCII file output, which you'll have to fiddle with in 1-2-3 before you can use it. Look for a package that can accept unconverted 1-2-3 data formats.

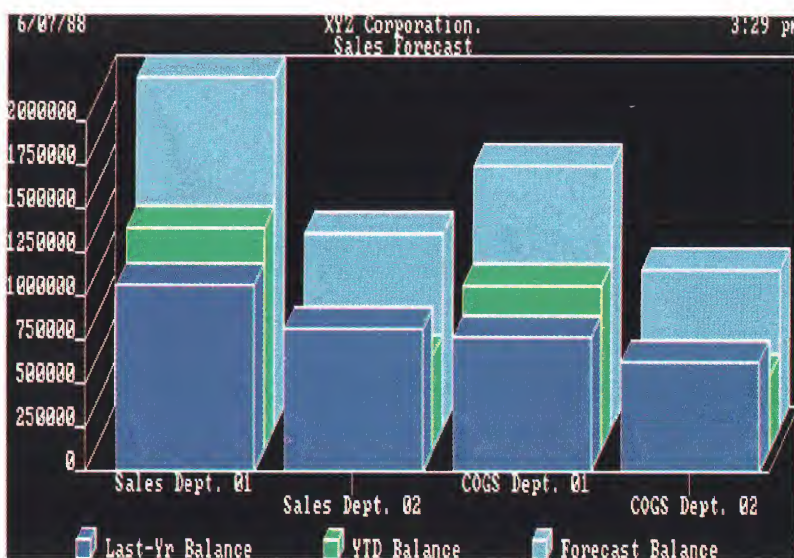
Manusoft's \$199.95 *Ready to Run Accounting for Lotus 1-2-3*, a good entry-level package, comprises a set of 1-2-3 templates. It stores data in standard 1-2-3 files that you can access just as you would any other spreadsheet file.

Advanced spreadsheet users can write their own programs in the 1-2-3 macro language, accessing or even inputting *Ready to Run Accounting* data. You can build an extensively customized system around the program's standard functions.

Micro Associates' *Mica* (which runs from \$495 to about \$5,000, depending on options selected) is one of the few packages with a bona fide set of built-in management exception reports. These reports spare you routine details and tell you only about problems (such as overdue bills greater than a certain amount or past a certain date).

Some packages that produce great management reports—such as Q.W.Page Associates' \$995 *NewViews*—may seem alien to bookkeepers. *NewViews* is a must-see, though, if you're willing to work at designing your own setup.

Don't be fooled by *Dac-Easy Accounting's* low price of \$99.95. The Dac Software program offers more than you'd think, integrating general ledger, accounts receivable, accounts payable, billing, inventory, purchase order, and forecasting. This powerful package also has fine reporting capabilities. For an additional \$99.95, you can add the excellent payroll module.



Dac-Easy Accounting users can easily produce graphs from selected data in the accounting database.

You're ready to run *Dac-Easy Accounting* after it automatically installs itself, in 5 minutes flat. The package includes a predefined chart of accounts, and you can also create your own. During the setup procedure, *Dac-Easy* prompts you for the estimated number of customers, vendors, products or services, and invoices per day to establish the appropriate file sizes. The program's extensive inventory capabilities accommodate average cost, standard cost, and last purchase price calculations.

Graph Mate, an optional *Dac-Easy* utility (\$198 along with *Dac-Easy*), offers a handy way to enhance your reports. It can produce graphs—even 3-D stacked bar charts—from current data each time you run a report. And *Graph Mate* makes your work even easier: it will record keystroke sequences so that you can use just one

command to create graphs.

Bedford Software Corp.'s *Integrated Accounting* offers integrated general ledger, accounts payable, accounts receivable, payroll, inventory, and job cost modules, all for \$249. Installing and using the menu-driven program is easy.

Integrated Accounting is less comprehensive than many sophisticated accounting packages. It maintains only limited customer and vendor information and can't handle discounts. The maximum number of customers, vendors, employees, and inventory items is 999 each. But you can produce automatic income statements instantly, for any period.

More-ambitious managers may want a package with documented source code—which is not as daunting as

you might think. Many packages are now written in high-level database languages, and a number of tools are available to help you program them. A popular program written in *dBASE III PLUS* is *SBT Database Accounting Library* (from \$395 to about \$3,000, from SBT). You can modify it progressively to fit your needs, on your own or with the help of a *dBASE* programmer. SBT has been widely adapted to meet the needs of specific industries, and a "vertical" version that suits your company may be available; check with SBT before you spend time and money having a program written from scratch.

For a superb set of reports, consider TLB's *Solomon III*. Starting at \$890, it's not for beginners, but its reports are something to shoot for.

Kate Ambrose Brown is a consultant and writer based in New York City.

Dac-Easy Accounting, Version 3.0

List Price: \$99.95; with *Graph Mate*, \$198.

Requires: 512K RAM, two disk drives, DOS 2.0 or later.

In Short: This budget-priced accounting program has a full set of features and, true to its name, is easy to use. *Graph Mate* graphs data in *Dac-Easy*'s reports.

Dac Software Inc.
17950 Preston Rd., #800
Dallas, TX 75252
(800) 992-7779
(214) 248-0205

Integrated Accounting, Version 3.23

List Price: \$249

Requires: 384K RAM, two disk drives, DOS 2.0 or later.

In Short: Economical and "all-in-one," this accounting program is a double-entry package with help screens and a tutorial. But it maintains limited customer and vendor information and can't handle discounts.

Bedford Software Corp.
15311 NE 90th
Redmond, WA 98052
(206) 883-0074

Mica

List Price: \$495 to around \$5,000, depending on options.

Requires: 384K RAM, hard disk.

In Short: A mid-level modular accounting program, *Mica* stands out from the rest with its management exception reports.

Micro Associates
2349 Memorial Blvd.
Port Arthur, TX 77640
(409) 983-2051

NewViews

List Price: \$995

Requires: 512K RAM, hard disk.

In Short: This one-module-does-all accounting package may confuse bookkeepers. It requires more effort to learn and use, but its adherents—accounting pioneers—swear by it.

Q.W.Page Associates Inc.
1 St. Clair Ave. W., 8th Floor
Toronto, Ontario
Canada M4V 2Z5
(416) 923-4567

Peachtree Complete II: The Business Accounting System, Version 4.21

List Price: \$199; *Peachtree Data Query II (PDQ II)*, \$199.

Requires: 384K RAM, 10MB hard disk, DOS 2.0 or later.

In Short: With a remarkable number of features at a low price, this modular accounting program gets a boost from *PDQ II*, which transfers data to a spreadsheet.

Peachtree Software
4355 Shakleford Rd.
Norcross, GA 30093
(800) 247-3224
(404) 564-5800

Quicken

List Price: \$49.95; custom report/spreadsheet output utility, \$19.95; tax adviser utility, \$29.95.

Requires: 256K RAM, one floppy disk drive.

In Short: This easy-to-use single-entry accounting program started out as a simple automated checkbook, but now does much more.

Intuit Software
540 University Ave.
Palo Alto, CA
(415) 322-0573

Ready to Run Accounting For Lotus 1-2-3

List Price: \$199.95

Requires: 384K RAM, two disk drives (hard disk recommended), *Lotus 1-2-3*.

In Short: The best-known spreadsheet-based accounting package, this program is written entirely in 1-2-3 macros.

Manusoft Corp.
8570 W. Washington Blvd.
Culver City, CA 90232
(213) 559-1561

SBT Database Accounting Library

List Price: \$395 to around \$3,000, depending on options.

Requires: 512K RAM, hard disk.

In Short: This serious modular system, written in *dBASE III PLUS* (and soon to be in *dBASE IV*), is one of the most customizable accounting packages available, with numerous versions for specific industries.

SBT Corp.
One Harbor Dr., #300
Sausalito, CA 94965
(415) 331-9900

Solomon III, Version 5.0

List Price: \$890 to around \$7,000, depending on options.

Requires: 512K RAM, hard disk.

In Short: With sophisticated reporting capabilities, this high-end modular accounting package is for sophisticated users. The latest version is easier to use, thanks to a new menu-driven interface.

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COMPUTING

Great Moments in

The best
of the worst

By STEPHEN BANKER

Computing is not all perfectly serried rows of ones and zeros. There is the occasional faux pas. Take the case of Geraldine Ferraro and the accidental rabbis. . . .

Or the coding error that convinced millions of TV viewers in Quebec that a revolutionary shift in their government had taken hold. . . .

Or the typo that almost started World War III.

The first two incidents were merely embarrassing; the third bordered on terrifying. But they do have something in common. They were computer errors. And all computer errors—be they large or small, silly or outrageous, frightening or (in rare cases) an improvement on an intended design—can be traced to one inherently unreliable part of the system: us.

Hey, anybody can make a mistake.

Thank You, Dear Rabbi

Let's start with the politician and the clergy.

A few weeks after the 1984 election, two letters from Democratic vice-presidential candidate Geraldine Ferraro arrived at the Cincinnati home of Mae Bellman and her son, Dennis Rogers.

Ferraro was writing to offer thanks for their contributions to the ticket. It was the sort of follow-up note that politicians routinely send out in the wake of a campaign. But what gave Mrs. Bellman and her son pause were the remarkable salutations: "Dear Rabbi Bellman," "Dear Colonel Rogers."

"I've been a Catholic all my life," said Mrs. Bellman, "and Dennis isn't in the Army."

It didn't take long before Bob Guillette, data processing manager of the Democratic National Committee in Washington, realized that the problem extended far beyond Cincinnati.

"We went back and looked at our dumps of the tapes," recalls Guillette, "and sure enough, it was visible: *Rabbi, Rabbi, Rabbi*. We said, 'Uh-oh, can't have that many rabbis. Maybe some, but not *that* many.'"

Stephen Banker, a former columnist for Popular Computing, has published in Smithsonian, PC Week, Computer-World, and Science Digest. He writes frequently about new technology.

The problem, perplexing as it seemed, was simple at its core. The DNC's direct-mail software listed 50 titles, with *Mr.* and *Mrs.* at the top of the list. When an operator inadvertently hit an extra key, the worksheet was skewed one character to the right. Everything thereafter built on the original mistake, so that what should have been, for example, 01,02,03 became x0,10,20,3y, with "x" the accidental key and "y" the correct but misplaced beginning of a new code. Thus *Mrs.* became *Rabbi*, *Mr.* became *Colonel*, and so on.

When mistakes like this occur, we blame the mechanical side of the equation. "But all the computer does," says Larry Smarr, director of the Center for Supercomputing Applications at the University of Illinois, "is take cues and execute them one by one. It has no way of knowing if what it receives is a sensible instruction."

Can't we install some sort of fail-safe device? Wouldn't more and better programming save us from . . . well, *us*?

"One would have to have a higher computer checking the instructions," says Smarr, "and a higher one, and on and on. It's an infinite regress. *Who's going to watch the watchers?*"

Underdog Power in Quebec

The problem is that even glitches can seem convincing when they are expressed via computer.

In the 1981 provincial election in Quebec, the struggle was between the Parti Quebecois (PQ) and the Liberals, with a few splinter groups nominally in the contest. But lo, on election night the computer at a Montreal TV station spewed out the news that one of the splinter groups, the Union Nationale, was in a neck-and-neck contest with the PQ, while the obscure Marxist-Leninist Party (with only a few hundred registrants) had actually taken a seat in parliament.

Did the commentators say, "*Merde alors, ce n'est pas ça!*"? No. On the basis of the printout, they patronizingly referred to the "so-called experts who had written off the Union Nationale," and of the Marxist-Leninists they declared, "The people have spoken."

In the end, the Reds got nowhere and the Union Nationale tallied the predicted 4 percent of the vote. The bug proved to be a confusion between the alpha-

Dorothy,
Pay no attention to that
man behind the screen.
I am the great and powerful
Wizard of Oz.

betical order of the ridings (voting districts) and the order of the top vote-getters. It was a goof only an inanimate object could make. But the experts believed the absurd declarations of the machine—and acted on them. Such is the authority of the computer.

Slightly Off Target

Even the computers used to guide the billion-dollar war machines of the superpowers are not immune to errors.

In January 1985 an unarmed Soviet cruise missile streaked out of Siberia into Norwegian skies, and thence to a touchdown in Lapland's Lake Inari, where the pieces were recovered by Finnish authorities. There was only silence on the subject from Moscow, but Western experts said the missile had bolted 180 degrees off course, likely because of a programming error. The unanswered question was what might have happened had the missile been armed. But that's the Russians. It could never happen to us, right?

Military Mishaps at Home

A U.S. Senate study showed that in the first half of 1980 our frontline NORAD missile defense registered ten false alarms a day. What caused them? Flocks of birds, off-course aircraft, atmospheric anomalies, screen glitches, and a few Soviet test firings.

"I'm more worried," says Yale sociologist Charles Perrow, "about an accidental war than a deliberate one between the superpowers."

In his book *Normal Accidents*, Perrow reviews how a training tape, mischanneled to the main system, sailed past the computer checks and triggered an alert in November 1979 at NORAD's Colorado headquarters. Two more alarms a few months later were caused by a defective 46-cent microchip.

Not all military computer mishaps whisper of doomsday. A bug in a preproduction F-16 navigational aid tried to flip the aircraft upside down every time it crossed the equator.

In the publicity surrounding the Penta-

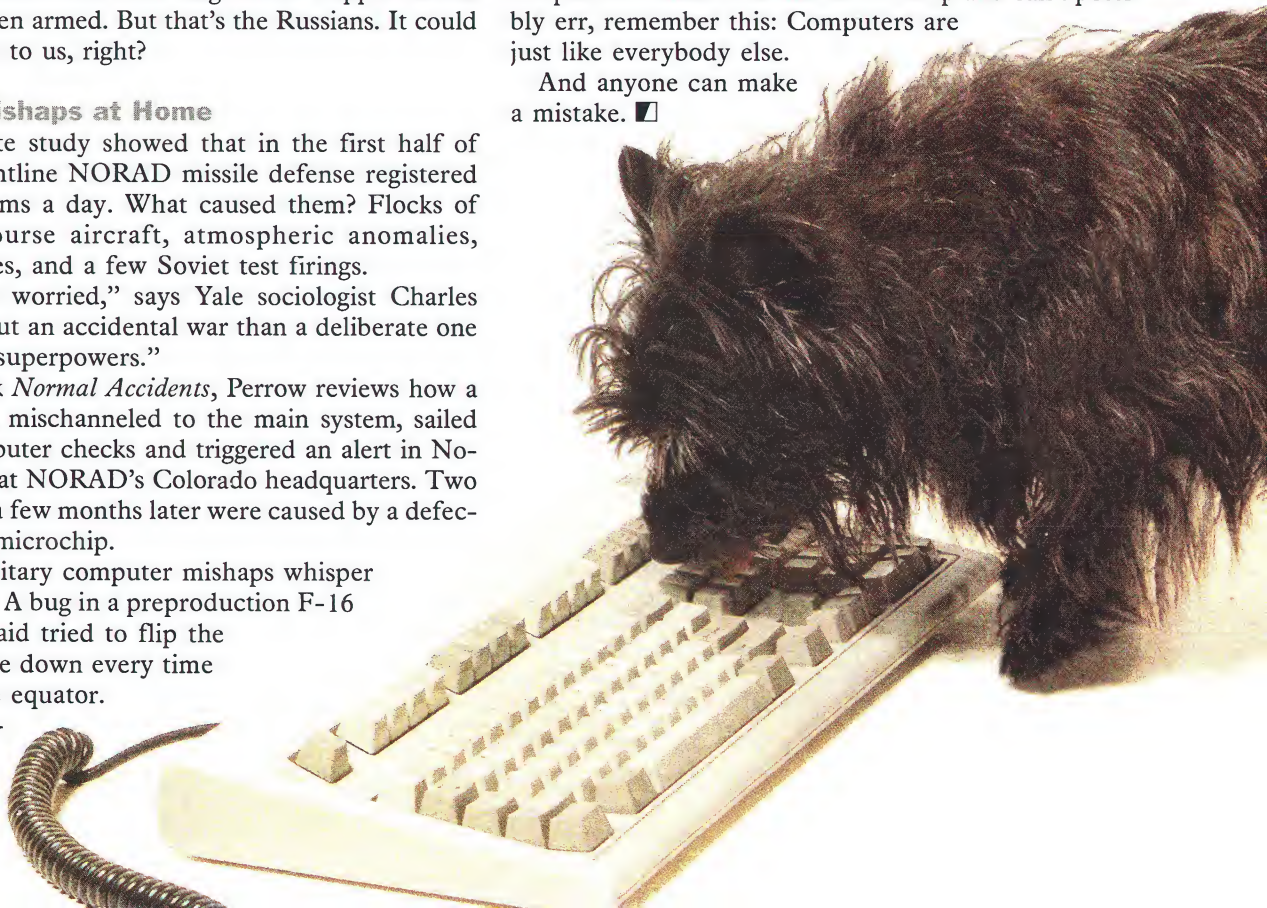
gon's 1985 cancellation of the Sergeant York antiaircraft cannon, the computer-as-weapon angle was overlooked. This was an example of a device based on microchips and run by software. When the American and British gathered at Fort Bliss, Texas, to review the prototype of the Defense Department's billion-dollar investment, they got an eyeful.

As soon as the mechanism was switched on, the turret whirled about, aiming the barrel at the reviewing stand. There ensued a rapid redeployment of generals. After on-site adjustments, the York doggedly pointed at the ground. Subsequently its radar locked onto a latrine, mistaking the ceiling fan for a helicopter blade.

It all boils down to this: Our computers are as perfect as we are.

So the next time you snuggle up in bed, entrusting the planet to machines that never sleep and can't possibly err, remember this: Computers are just like everybody else.

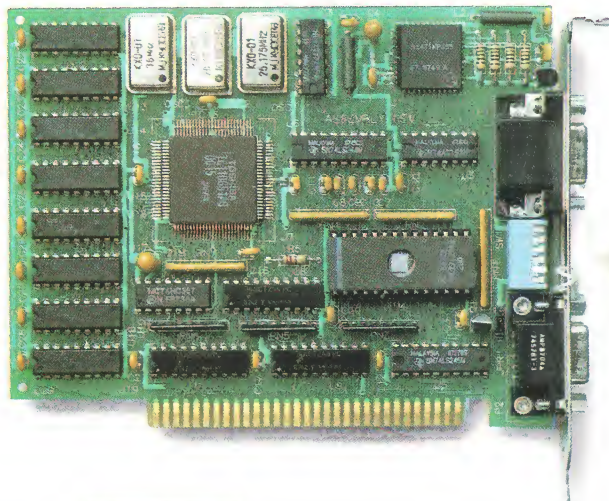
And anyone can make a mistake. ■



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CIRCLE NO. 168 ON READER SERVICE CARD.

electronic mail comes of age

... but it still has a lot of growing up to do

By DAVID DEJEAN

Hundreds of thousands more Americans learned about electronic mail this year.

They learned the good news: that e-mail could bring a convenience, accuracy, and immediacy to communication that no other medium can match.

And they learned the bad news: even though there are more users today than there were a year ago, the person they want most to communicate with right this minute probably isn't reachable by electronic mail. Most often, they learned this when their PCs were connected to a local area network (LAN) at work.

The Electronic Mail Association says there are 4.25 million users of business e-mail systems. The association also says there are 1.75 million users of "public" e-mail systems. The difference between private and public systems is fundamental.

Private electronic-mail services use a mini or mainframe computer as a host, or they use systems distributed on a LAN. The large computer companies sell e-mail systems as part of their office-automation packages: Office comes from Wang Laboratories, PROFS (Professional Office System) from IBM, All-in-1 from Digital Equipment Corp. The leading vendors of LAN software sell e-mail packages for their systems. And several office-automation software houses offer standalone e-mail systems—like Higgins Mail from Conetic Systems, cc:Mail from PCC Systems, and The Coordinator from Action Technologies.

Public e-mail systems, on the other hand, are not software packages, but dial-up services, accessible via modem from anywhere in the country. Subscribers can trade messages with each other. The profit motive is a factor in public systems. Some, like MCI Mail, charge according to the length of the message. Others base their charges on some combination of connect time and quantity of data stored; the on-line information services that also offer electronic mail, such as CompuServe and The Source, fall into this category.

The growth of e-mail, whether public or private, has been accompanied by an increasing seriousness of purpose. Corporations' private e-mail systems may once have been used primarily for reminders of meetings and cheery invitations to the departmental softball games, but no more. Business takes the value of communica-

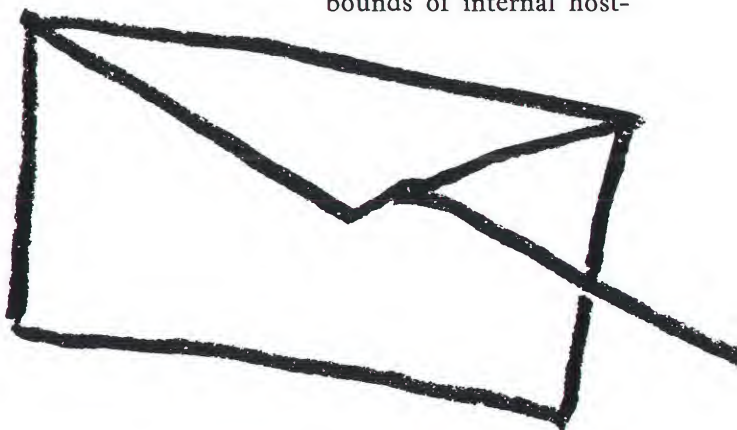
tion seriously and is using e-mail as a building block in systems that speed the flow of critical information: orders and sales data, training materials, price lists, and inventory. Here are a few examples.

- Chrysler Corp. has connected its internal e-mail system (PROFS) to a private-label system from GE Information Services, which also operates the public GENIE system. Chrysler opened its system to field personnel, regional offices, and its 6,500 dealers. The system carries messages and bulletins and also collects data for the company's mainframe computers.

- American Sterilizer in Erie, Pennsylvania, installed cc:Mail software in its local area networks to complement its host-based PROFS. The LAN-based system supplanted the IBM service and grew to link 650 users in Pennsylvania, facilities in Alabama and Canada, and 11 regional sales offices. The system has been extended to 45 vendors to implement a Just-In-Time inventory program.

- The Anglican Church used an international e-mail system developed by Unison Communications to link those attending an international conference to their home countries. The Lambeth Conference—held in Canterbury, England, from July 16 to August 7 for bishops of the worldwide Anglican communions—was served by IAIN, the Inter-Anglican Information Network. The church hopes to use IAIN to link its national divisions, many of which are in Third World countries.

Electronic-mail systems are spreading beyond the bounds of internal host-



based or LAN-based e-mail systems, but there are a couple of barriers to the technology's further development.

One is technical. It's relatively easy to send plain text from one computer to another over the telephone wires. But other kinds of computer information are tougher: binary files, such as graphics or *Lotus 1-2-3* spreadsheets, may contain nontext characters the e-mail system itself uses for control functions. If the system can't tell content from command, it can't function.

There are solutions. Lotus offers *Express*, an e-mail management program that works with MCI Mail. *Express* users can transfer Lotus worksheets on MCI and can also take advantage of the program's automated mail handling.

A second problem is that organizations are looking for ways to speed the movement of information that gets put into forms—invoices, order forms, bills of lading. This effort goes under the name "electronic data interchange" (EDI). For EDI to be effective, it demands a broader reach for e-mail—beyond internal systems or even carefully connected small groups, and out into the big, wide world.

This is the biggest challenge for e-mail: linking all the various "islands of communication," in the words of Michael Cavanagh, executive director of the Electronic Mail Association in Washington, D.C.

"Internal systems are spreading like wildfire in corporate America," Cavanagh says. "That's the first step. For the short term, Company X can have its suppliers and venture partners hook onto a system and exchange information conveniently."

A universal electronic-mail system—the interconnection of those large islands of communication with a public system—is an effort for the longer term. Cavanagh is confident that it will happen soon.

"Down the road, you move toward the ubiquity people would like to have," he says. "The telephone industry took 40 or 50 years to gain ubiquity. The computer industry is certainly moving at a

greater pace than that."

Meanwhile, e-mail users are learning the advantages of electronic communication: the ease of sending electronic carbon copies, the end of telephone tag, the convenience of being able to retrieve information. But as they raise their heads to look beyond their own islands of communication, they find that reaching other islands is easier said than done.

To connect all the islands, e-mail needs uniform addressing, says Catharine Vinson, chief operating officer of Unison Telecommunications Service in Cincinnati, developer of the Anglicans' information system. She hopes to see a national e-mail system—but, she adds quickly, not one run by the government.

"People don't want to talk to systems," Vinson says. "They want to talk to people."

"There are universal addressing schemes that work. Why can't I just send e-mail to you at your telephone

► corporate use: American Business Dials In

David Hindawi has thought a great deal about electronic mail. It's his business: he's president of Software Ventures, and his company's major product is *Microphone*, a widely used telecommunications program for the Macintosh.

He thinks the separation between corporate electronic mail (whether on mainframe or LAN systems) and external public systems is a problem that needs solving if e-mail is going to be widely adopted.

"People are getting tired of having to carry different tools in their hip pockets—MCI is one tool, a LAN is another," Hindawi said. "They want to have one tool to address all of that."

The problem he sees is that e-mail users have to deal with multiple systems—and remember multiple procedures—to do one thing: communicate.

Why should an e-mail user have to go into one system to read his local network messages, then dial a telephone number and log on to a different system to read mail from farther afield?

Why couldn't a mail system log on to the user's public e-mail system, pick up waiting messages, and forward

them to the local-system mailbox?

That part seems simple enough. But Hindawi doesn't stop there.

"I have my account on a LAN system," he said. "But I fly to New York. So I call up my local system and tell it to send all my messages to MCI."

The result must sound like nirvana to any e-mail user with multiple accounts: all his mail in one place, and always the most convenient, accessible place.

We're still several miles from nirvana, of course. And Hindawi has thought about the hurdles that must be cleared in order to get there.

Hindawi says two things are holding back the explosive growth of electronic mail: first, the software at the user end isn't as good as it could be. (Admittedly, he has a vested interest here—his company's *Microphone* software has programming capabilities often used to create simplified telecommunications routines for computer novices.) Second, he says, electronic-mail technology isn't as good as it could be.

It certainly isn't as good as his vision of the future. But in the world of e-mail, few things are.

—David DeJean

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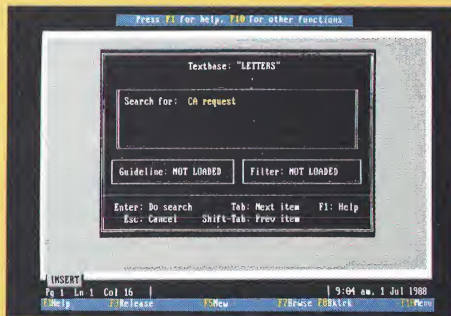
Picture an executive opening her IZE and requesting an outline of letters re-

sponding to inquiries for information written to contacts in California. Based on the request, her complete collection of letters is searched. IZE finds 190 information response letters to addressees in California.

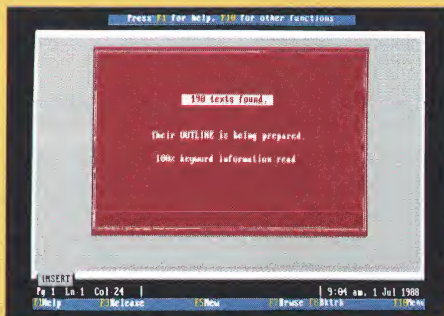
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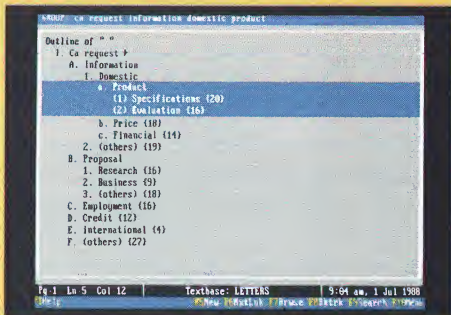
The executive simply hot links directly from IZE to a spreadsheet document. The figures are found and the executive gives it a final



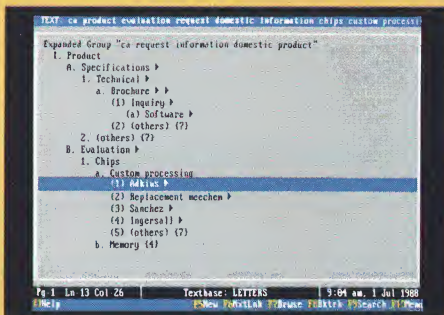
0:00:05 With IZE open, a request is made.



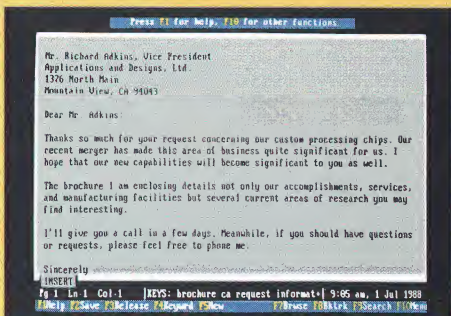
0:00:17 In seconds, IZE organizes the facts.



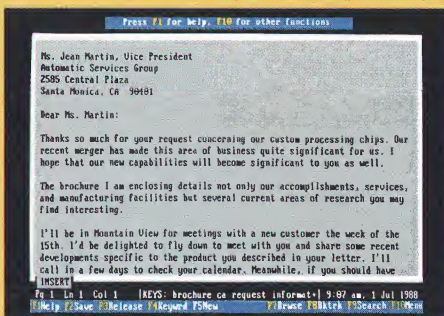
0:00:24 An outline appears to scrutinize.



0:00:35 The outline expands to sharpen focus.



0:01:01 The facts are found ready to revise.



0:03:20 A new, customized letter is ready to print.

the question answered. Returning to the customized letter, the question answered. Returning to the customized letter, the question answered. Returning to the customized letter, the question answered.

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CIRCLE NO. 146 ON READER SERVICE CARD.



Electronic-mail services are almost easier to use than they are to define. The companies named in this selective list offer a wide range of services. They fall into several groups (and some fall into more than one).

At one end of the spectrum are the services aimed at individual users: CompuServe, Quantum, The Source, and others. These offer e-mail without many frills as part of a supermarket of services: bulletin boards and on-line "chat" functions, special-interest groups for products of various manufacturers, information and transaction services that range from the Associated Press news wire to home banking to hunting for bargains in an "electronic mall."

Public e-mail services—among which MCI Mail, Telemail, AT&T Mail, and EasyLink are the best-known—offer mailbox service for messages and text files as their basic product. Then they elaborate on it, offering mailing lists that send a single message to many mailboxes, hard-copy services that turn an electronic message into print for delivery via surface mail or courier, and e-mail-to-Telex connections (and in some cases Telex-to-e-mail). In some services, graphic elements—say, signatures or company logos—can be "registered" and incorporated into hard-copy documents.

"Private-label" services create and manage a closed user group with access to a menu of customized functions. These can include e-mail and bulletin boards, database retrieval and information services, automated forms preparation and electronic document interchange (EDI), and links to companies' internal host-based or LAN-based e-mail systems.

AT&T Mail	(800) MAIL-672
CompuServe	(800) 848-8199
DASystems Inc. (intersystem transfer services for subscribers)	(408) 559-7434
Dialcom (private-label e-mail services)	(800)435-7342
Electronic Mail Association ...	(202) 293-7808
GE Information Services (GEnie and Business Talk information and e-mail services, private-label e-mail)	(800) 638-9636
Graphnet Inc. (private-label e-mail, mailing services)	(800) 336-3729
iNet Company of America (INET) (e-mail, conferencing, database retrieval)	(800) 322-4638
Maxcom Corp. (e-mail and information services, MAXTALK e-mail-to-voicemail conversion)	(617) 890-8822
McDonnell Douglas Applied Communication Systems Co. (private-label e-mail and host-based services)	(800) 435-8880
MCI International (MCI Mail)	(800) 333-6200
National E-Mail Registry (directory assistance for e-mail users)	(800) 843-6088
Quantum Computer Services Inc. (public and private e-mail, bulletin-board and information services)	(800) 782-2278
The Source	(800) 368-3549
Telenet Communications Corp. (Telemail)	(800) TELENET
Unison Telecommunications Service	(800) 334-6122
Western Union Corp. (EasyLink)	(800) 527-5184

gotta have it
More Information

The E-Mail Registry and DASnet—hardly lasting solutions to the challenge of making e-mail a universal communications medium.

number? Everybody knows their phone number."

While Vinson's vision of people sending e-mail without worrying about which system they're on is a long-term goal, a couple of existing services point in the right direction—the National E-Mail Registry and DASnet.

The National E-Mail Registry is a database retrieval service for users of e-mail. A user must sign up with the service—which lists her e-mail, Telex, and facsimile addresses in the directory. Once registered, she can make a long-distance call to search the database for the addresses of other users. Successful searches cost 50 cents; there is a credit-card billing system for individuals and a flat annual fee for corporations.

There are currently about 23,000 names and addresses in the E-Mail Registry, according to its president, Ken Steele. Obviously, the service would be more valuable if the electronic-mail systems would make their customer databases available to it. They have been reluctant, says Steele, but the E-Mail Registry is pursuing them.

DASnet has already won the approval of 21 e-mail system operators. DASnet handles the intersystem transfer of electronic-mail systems on four continents. Most of the major public e-mail systems are included.

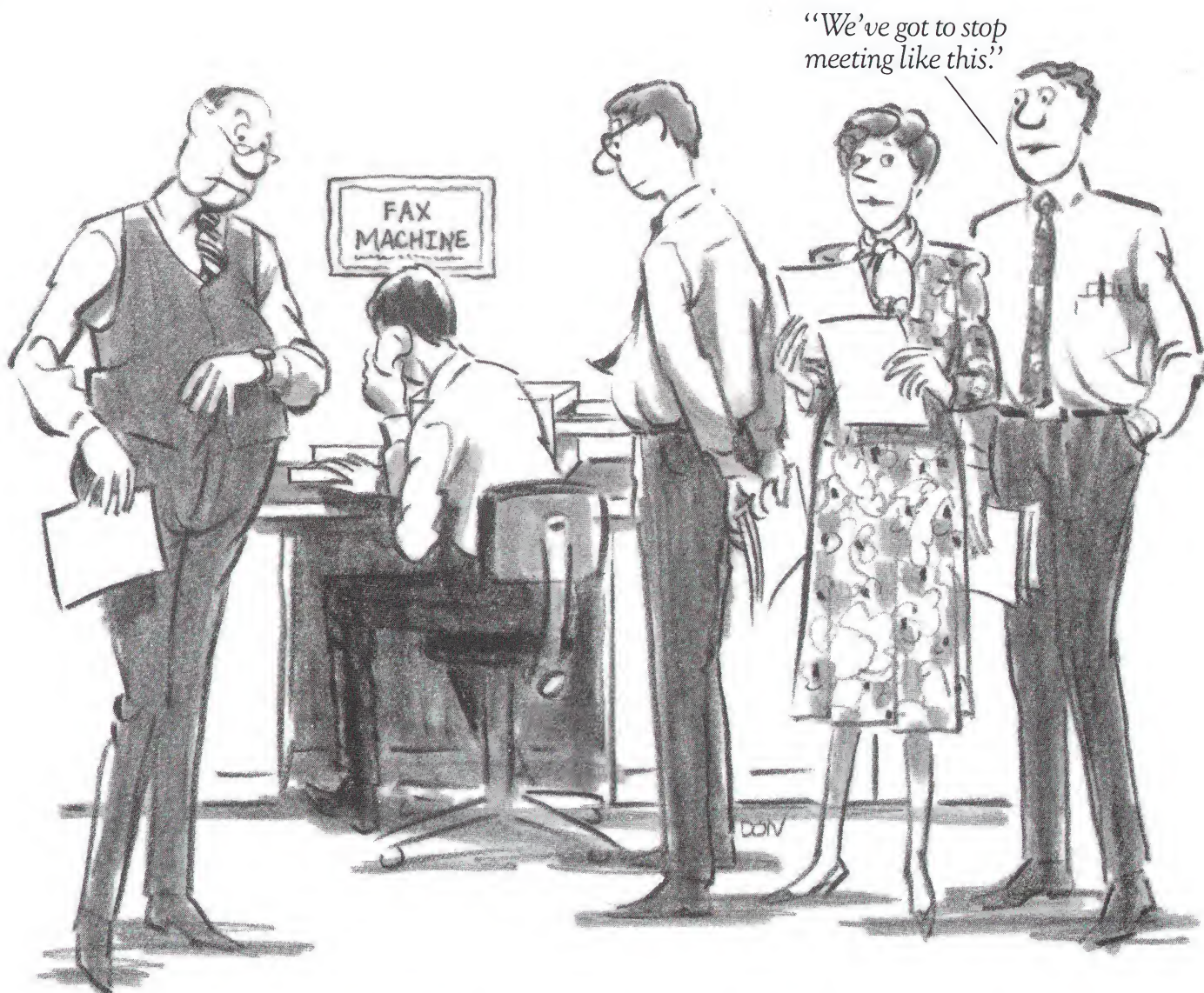
DASnet is a subscriber service like the E-Mail Registry. Some e-mail systems have written their own software for easy access to DASnet—and handle billing as well, making intersystem exchanges as easy as possible for their users. For users of other systems, DASnet will bill directly (via e-mail, naturally) once a month. DASnet offers e-mail-to-U.S.-

mail and e-mail-to-facsimile services, and companies can connect their internal mail systems directly to DASnet.

While these services may be useful, even necessary, in the short term, the E-Mail Registry and DASnet are hardly lasting solutions to the challenge of making e-mail a universal communications medium. That depends on some major developments—in standards for electronic-mail formats and in digital transmission technology to link e-mail systems.

A standard has been put forward to make sure the message sent from one e-mail system can be received by another. Called X.400, it was prepared by the International Telephone and Telegraph Consultative Committee of the United Nations. Most U.S. hardware and software makers have endorsed the standard. But for many reasons, universal adoption of X.400 is a long way off.

"I've been five years waiting for X.400," Vinson says, "and I'll probably wait another 15. There are problems

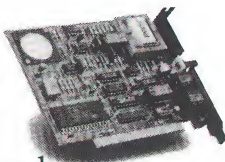


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with compatibility; there are many flavors of X.400. All the e-mail systems' software will have to be rewritten to conform to the standard."

In particular, she says, the "message transfer agent," software that handles the conversion of messages from one system format to another, is a big investment for many e-mail system operators. Some of the bigger systems have already made that effort: Dialcom and Telenet offer X.400 services, and MCI has promised to deliver X.400 capabilities this year.

The development of physical interconnections among e-mail systems is just as crucial as the development of a standard. If public electronic mail is to become as ubiquitous as the telephone, it will have to have a public data-transmission service at least as elaborate as the telephone system provides.

Such services are already going on-line. Data America, a new company headquartered in Vienna, Virginia, is creating what its management calls the next-generation data-communications network and services company.

In June the company unveiled a national fiber-optic network with extremely high capacity and high operating speed. The system is dedicated as a packet-switched network, the state-of-the-art solution for handling high

volumes of digital data.

The architects of the Data America network are an all-star team of alumni from such networking and electronic-mail companies as Telenet, MCI, Tymnet, and The Source. They see their network as more than just the delivery system of the future, says Jim Southworth, Data America's vice president for special projects. They envision services such as packetized voice transmission, which would require extremely high transmission speeds, and graphics embedded in text files, which would necessitate a network control system able to handle binary files.

"We have the platform," Southworth said. "This is for more than just e-mail. It is super-high-speed, super-flexible, and adaptable—and that's not redundant. The network will adapt intelligently to the kind and loading of the traffic it's carrying. And it has a high degree of flexibility on the input side in terms of what's plugging into it."

How will we know when electronic mail has finally arrived? Catharine Vinson has a ready answer. "When we start to get junk e-mail. And I'm already seeing some." ■

David DeJean is a senior editor at PC/Computing.

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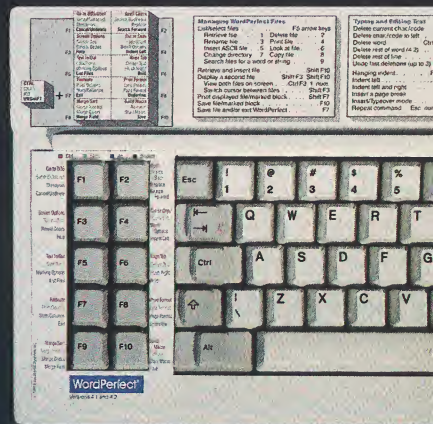
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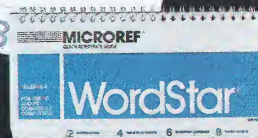
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CIRCLE NO. 125 ON READER SERVICE CARD.





best bets for better backup

By VAN WOLVERTON

A cynic describes the computer as a machine that lets you make mistakes faster than you ever could before. In this jaundiced light, a hard disk is a storage device that lets you lose far more data than you ever dreamed possible.

There's no denying the putting-all-your-eggs-in-one-basket quality of a hard disk. But the convenience and speed outweigh the increased risk. Former users of floppy-disk-based systems, if asked to give up their hard disks, would just as soon swap their copiers for carbon paper.

Because today's hard disks are remarkably reliable, the chances of a serious problem are blessedly small. But because the increased capacity of hard disks has dramatically increased the significance of a failure, two types of security programs have evolved to ensure the safety of files on your hard disk: backup and recovery.

Backup programs simplify the chore of copying files from hard disk to diskettes or other storage media, such as tape car-

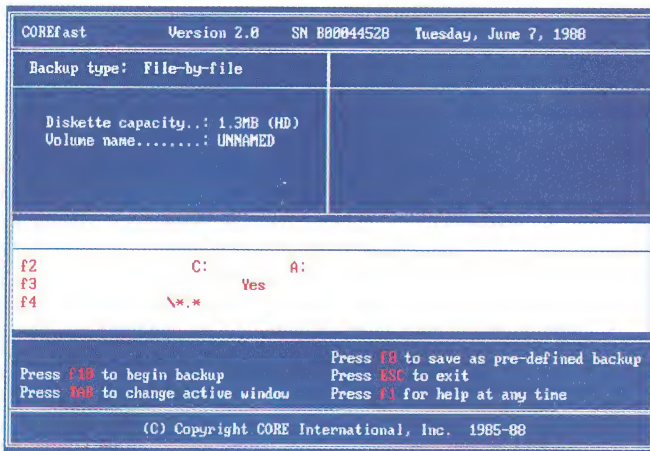
tridges. Recovery programs retrieve a file that was inadvertently erased or even restore the contents of an entire hard disk inadvertently reformatted.

When used diligently, backup programs reduce the consequences of a hard disk failure from catastrophe to inconvenience. Recovery programs can relieve the dismay that comes when you realize you didn't mean to erase *that* file, or the stark terror that accompanies the realization that you just formatted your hard disk instead of the diskette in drive A:

The consequences of a failure—yours or the machine's—depend on how often you back up your disk; thus, ease of use is more than just a cosmetic feature of backup programs. The less they require of you, the more frequently you're apt to back up your data and the less you'll lose if your hard disk fails.

Common Operations

All backup programs include several common functions. The simplest but most time-consuming



The Corefast menu takes a windows-like approach.

function is a *full backup*—transferring every file from the hard disk to diskettes. Depending on the capacity of your hard disk and diskettes, this takes 10 or 15 minutes and requires 10 to 40 diskettes. Fortunately, an occasional full backup will suffice.

A *partial backup* transfers to diskettes only files that have been changed. In most cases, this process takes just a minute or two, because you don't need to back up your program files or any data files—such as word processing documents or spreadsheets—that haven't changed. Depending on which program you use, a partial backup transfers files that have changed since either the last partial or the last full backup. Some programs require a separate disk for each partial backup, while others let you add partial backups to existing backup diskettes.

A *full restore* transfers all files from your full-backup diskettes to a hard disk, reconstructing the

directory structure if necessary. You can restore the files to the same hard disk or, if the original hard disk has failed, to a different one.

A *partial restore* transfers some of your backup files from diskettes to the hard disk. This can range from a single file to all files in one or more directories. In most cases, when restoring a file you can rename it, assign it to a different directory, or copy it to a different disk.

Most programs show you an estimate of how long the backup will take and how many diskettes it will require. This can be reassuring (the times are usually short) and useful (it lets you stock up on diskettes before you begin).

You can simplify your daily partial backup by putting the backup program in a batch file. You could

the program by typing the filename at the DOS prompt instead of having to make menu selections all the way through.

Other Features

These common operations are all you need to protect your hard disk, but some backup programs are laden with other features. Some features are simple—for instance, formatting a backup diskette. Others are more elaborate. A visual file manager, for example, displays the names of directories and files and lets you copy, rename, or delete a file or series of files by simply highlighting the filename with the cursor and pressing a function key.

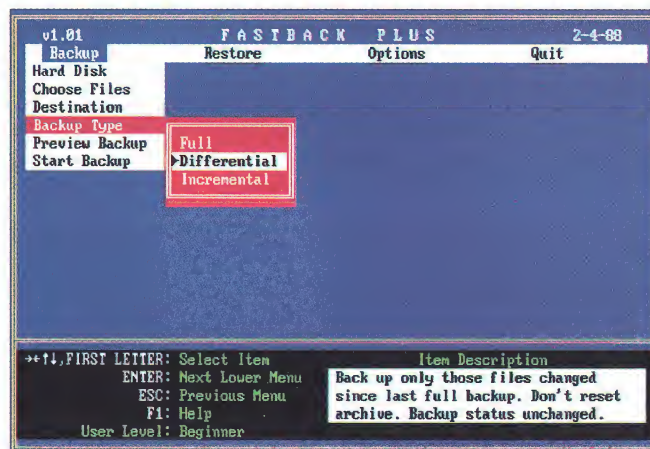
Some backup programs let you create a script file

that contains all the instructions that would otherwise require several menu selections and typed entries. You can then tell the program to take its instructions from this file, and you avoid having to work through the menu each time.

The more-elaborate backup programs include on-line help, available at the press of a key. If operation of the program is fairly intuitive and the on-line help is put together well, you may never need to refer to the manual after the first quick run-through.

Generally, the more features a program has, the longer it takes to learn. The more a program tries to do, the more restrictions it imposes and the more you have to remember. This can discourage you from using a backup program at all; it ought to be so simple and quick that you aren't tempted to skip it. So don't choose a program solely on the basis of the number of options.

Fastback's Basic menu makes it easy to choose the type of backup.



Common Sequence

You follow a similar sequence of events with every backup program. First, install the program. This can range from copying a few files to running a special installation program that asks questions, creates directories, copies files, and modifies some files on your fixed disk.

Next, make a full backup of your hard disk. Before starting, make sure you have enough diskettes; most backup programs recommend that you have enough to hold about 1½ times the amount of data to be backed up. (You should probably figure on at least two boxes.) After the full backup, label each of your diskettes—some programs come with special labels—and store them in a safe place.

At the end of the first day you use your system after the full backup, make a partial backup to protect the files you have changed. Depending on the backup

program you use, you may be able to identify new or changed files you don't want to back up regularly (such as those with the extension BAK created by many word processing programs).

After an interval of a week to two months, depending on which program you use and how many partial backup diskettes you want to accumulate, make another full backup and recycle the diskettes from your partial backups.

Follow a strategy. Decide how often you're going to do a full backup, and stick with your schedule (some programs force you to back up your files at a predetermined interval). Set aside the diskettes you're going to use for daily backups, label them, and use them for nothing else. Store your backup diskettes in a safe place; to be doubly sure, keep them separate from other diskettes, perhaps in

**Speed is oversold.
A few extra
seconds in daily
backup don't
matter.**

another room or building.

Too Much Help?

Most backup programs have similar features. Many, for example, try to automate installation by copying files, creating directories, and modifying some special files in the root directory. Such help is often a mixed blessing. Some copy their files into the root directory of your hard disk, which should be kept as clear of files as possible. Others add commands at the end of the file named AUTOEXEC.BAT.

If your AUTOEXEC.BAT previously ended with a command that starts a program (such as a word processor or spreadsheet) or displays a menu, DOS may not even see the added commands until you end the program or menu system (which could be never). If the backup program puts a Path command at the end

of AUTOEXEC.BAT that names the directory that was created for the backup files, this wipes out any command path you may have defined earlier. Most backup programs use tricks to transfer files from your hard disk to backup diskettes much faster than DOS can.

There's a can-you-top-this flavor to much of the advertising in this market, with several companies claiming to have the fastest backup program, but all the programs reviewed here are fast enough to do the job. In fact, speed is oversold; a few extra seconds in daily backup (and even a minute or two in a full backup) doesn't matter nearly as much as convenience or reliability.

Most programs let you choose whether to back up all files (a full backup) or just the files that have changed since the last backup. Some also let you specify directories, sets of files (using wildcard characters), or even individual files. Some let you back up files that haven't been backed up for a certain number of days. And some programs let you



**Fastback's Advanced Menu
offers more choices for selecting
files, such as by date.**

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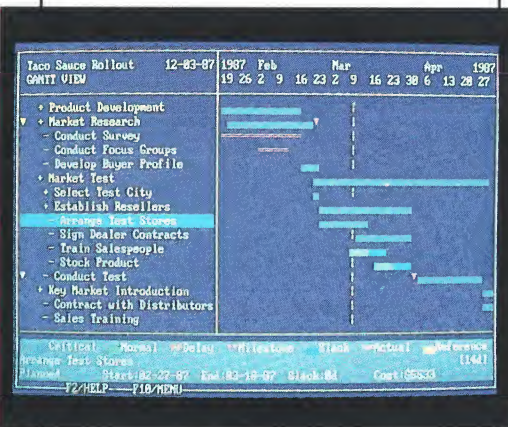
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► the second hard disk

You tell yourself it won't happen. But it will. One day you are going to drop a dictionary on your desk. Or lightning will strike. Or someone down the street will plug in a new walk-in freezer, sucking up every spare electron for miles around. And the read/write heads of your hard disk are going to fall out of their delicate Bernoullian orbit, slam into the disk platter, and carve a shallow—but completely fatal—furrow right through

the final, spell-checked draft of the 64-page report you're supposed to review with the chairman that afternoon.

What do you do? Undoubtedly you're going to cast aspersions on the dubious parentage of the drive. Then, if you've been a good scout, you're going to pull out the backups you made yesterday, calmly borrow a machine down the hall, and

print out the report.

You didn't back up your files yesterday?

The current generation of hard disks is just reliable enough to lull you into a sense of complacency. Why spend several hundred dollars on a tape unit and then go through the agony of waiting endlessly for it to offload your files?

And forget about using floppy disks; even at a puny 15 minutes per session, you'll lose a full day every month just backing up. Having not yet experienced a head crash, most people just don't bother.

There is a way to quit tempting fate, however, and it's almost painless. Large computer systems commonly have redundant hard disks, or two disks holding the same data. If one crashes, the operators just switch to the second drive.

Copying files from one hard disk to another is fast, taking seconds instead of minutes. Although a good tape backup unit will copy 40 megabytes of files from a hard disk faster than another disk can, disk-to-disk transfer is much faster for making a daily backup, when only a small number of files is changed each day. You can also use the second hard disk to store files you won't be using for a while.

Now get ready for some really good news: a 40MB internal hard disk will set you back only about \$400, the same amount as one of the slower DC2000 tape cartridge backup units costs. You won't need a new disk controller because the one you have will most likely handle two hard disks. There's no arcane, proprietary backup software to buy or learn: you can stick a simple DOS command into a batch file so that, when you finish for the day, your computer automatically backs up every file you've changed.

Creating a redundant double-disk backup system is simple. When you order your machine, just ask for two hard drives instead of one. You'll probably want to consider half-height hard drives so that you can squeeze both into a single, full-height drive bay, leaving the second bay open for one 5¼-inch and one 3½-inch floppy drive.

Half-height drives are available with capacities ranging well beyond 100MB. The Rodime RO 5130R holds 133MB; the Microscience HH-120 holds 122MB. Speed, once an issue with half-height drives, is no longer a problem. Most easily meet the specifications for an AT-class drive; they can find any byte on the disk in less than 40 milliseconds. Half-height drives using the high-speed ESDI (enhanced small drive interface) and SCSI (small computer systems interface) formats are also available.

If you shop for price alone, the best bargains are in the 40MB range. My choice, based only on price, would be a pair of Seagate ST251 half-height hard drives. Each will hold 40MB and can be found for as little as \$399.

If you already have a machine or don't have a vacant drive bay, you can install a second hard drive in an expansion slot using a hard disk card, which combines a disk controller and a 3½-inch hard drive on a removable expansion card.

The Plus Development Hardcard 40 and the Rodime R-Card 45 are the top name-brand contenders. Mail-order shoppers will find that house-brand systems start at about \$300 for a 20MB drive.

A redundant disk isn't fail-safe. If a tsunami-sized pulse of juice gets through your surge protector before it fries, two disks are as vulnerable as one. If there's a fire in the office, or if your computer is stolen, the second drive will suffer the same fate as the first.

This is where the drive-on-a-card really shines. The cards can be popped in and out of your computer as if they were gigantic floppy disks or tape cartridges. Slide one into the machine to make your backup, then pop it in the fire safe or carry it home with you at night. A growing number of software salesmen carry hard disk cards instead of dragging a demo machine around with them. At the client's office, they drop the card into any available machine and run their demos.

The best widely available backup software comes free with the most recent version of PC-DOS: it's the XCopy command. Once your second disk is formatted, duplicate the files of your primary hard drive by typing

```
XCOPY C:*. *D:/S
```

This will duplicate your files and preserve your subdirectory structure.

At the end of each working day—or more often, if you like—you can update your backup disk by using the /A and /S options to update only those files that have changed since your last backup:

```
XCOPY C:*. *D:/S/A
```

Put that instruction in a batch file called BYE along with a head-parking utility, and you'll have the perfect way to shut down your system. When you walk away, you'll have the serenity of knowing that the heads of your hard drive are safely tucked away, where they can't bounce onto the disk platter when the office cleaning staff shoves a cart into the back of your computer. And just in case disaster strikes, you'll have a full set of current files.

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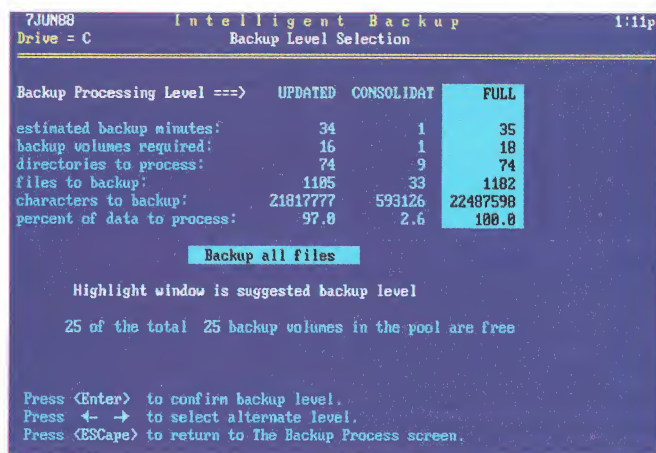
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PC-1

Intelligent Backup gives an automatic estimate for all three types of backup.



specify that you want to save every file changed since the last full backup, rather than since the last partial backup; this consolidates all your partial-backup diskettes and lets you reuse them without doing another full backup.

Although these capabilities give you more control, they also make a backup program harder to learn and use. It all depends on what you want. If your goal is to make daily backups quick and painless, you probably don't need anything more complex than a command like "back up all the files that changed today," which any program offers. On the other hand, if you're dealing with thousands of files on a large hard disk or if your computer is part of a local area network, you may need more flexibility.

Handling Large Disks

DOS can't handle a hard disk larger than 32 megabytes, so larger disks must be partitioned into separate disks (or *volumes*) of 32 megabytes or less, each with its own drive letter. To back up a large disk, you imitate DOS and

back up each partition separately, treating each one as a separate drive.

All of this sounds complicated and time-consuming, but it isn't—that's the whole point of these programs. Backup usually takes from 30 minutes to an hour to install and set up, then 2 or 3 minutes a day, plus 10 or 15 minutes every two or four weeks. That's about the cheapest insurance you can buy.

Here's a look at five popular backup programs: *Corefast*, *Fastback Plus*, *Intelligent Backup*, *PC-Full-Bak*, and *TakeTwo Manager*. Each is available on 5¼- and 3½-inch diskettes.

Corefast

Corefast will do just about anything you could ever want in the way of backup. *Corefast* may not be the easiest program to use, but Core International has gone to great lengths to make all this power accessible. The menus are straightforward, and the on-line help is good.

Installation is fairly simple: You run a program called *INSTALL* and answer a few questions. *INSTALL* modifies *AUTOEXEC.BAT* (on drive C:, no matter what hard disk you specify for installation) by putting statements at the beginning and the end; the *Path* command at the end is added to any command path you have defined. The program warns you that some of the commands might not be in the right place, but you're the one who has to solve the problem (with the help of the alternatives presented on the screen). The program adds no files to the root directory; instead, it creates a directory named *COREFAST* and puts all the files there.

Despite its wealth of options, you can install *Corefast* and start your first full backup in 30 minutes or less. Using a visual file manager, you can control which files are backed up, specifying any

level of detail you want.

Corefast is powerful, fast, and

complete. If you need total control over the backup process, and a good visual file manager, *Corefast* will do the job.

Fastback Plus

In *Fastback Plus*, a product of Fifth Generation Systems, installation is automated. The program prompts you through the process, asking questions and notifying you of progress. It puts no files in the root directory, and it asks you whether to modify *AUTOEXEC.BAT* and *CONFIG.SYS*; if you respond affirmatively, it puts two commands at the end of *AUTOEXEC.BAT*, with the same consequences as described for *Corefast*.

Fastback Plus also offers the same degree of backup control as *Corefast* does, but it is much easier to learn and use. In part, this is due to its lack of a visual file manager and its interface, which is easier to follow. The drop-down menus are logical and well

The PC-FullBak menu is Spartan, but does the job.

organized. You can choose Beginner, Experienced, or Advanced menus, depending on how many options you want.

The outstanding on-line help includes explanations of concepts as well as of menu choices. If you guess that FBINSTAL is the installation program, it's no trick to work all the way through your first full backup without looking at the manual.

Intelligent Backup

In Sterling Software Co.'s *Intelligent Backup*, the installation program (INSTALL) takes a creative approach to messing with your AUTOEXEC.BAT file: it displays the contents of AUTOEXEC.BAT with line numbers and lets you choose where to add the necessary commands. It then puts two files in your root directory and leads you directly to the first full backup.

The user interface is clear enough, and it includes a visual file manager. The on-line

help is adequate; it explains menu choices but leaves definitions of concepts and functions to the manual. Another oddity: the menus, the on-line help, and the manual use the word *volume* to refer to a disk and the phrase *mount a volume* to mean "insert a diskette." This terminology from the world of mainframe computers is out of place in a PC product, especially one that should do its best to appear warm, friendly, and easy to use.

Another intimidating factor is the way *Intelligent Backup* numbers diskettes and tries to force you to use them in a certain way. The intention is good (an orderly, fool-proof way to track backup diskettes), and you can override the system. But the uncertainty if you misplace a backup dis-

kette or want to do something not provided for could prevent effective use of the program.

Intelligent Backup requires more effort to learn than some of the other programs, but it offers as much flexibility as you could ever need, including the ability to back up disks on a local area network.

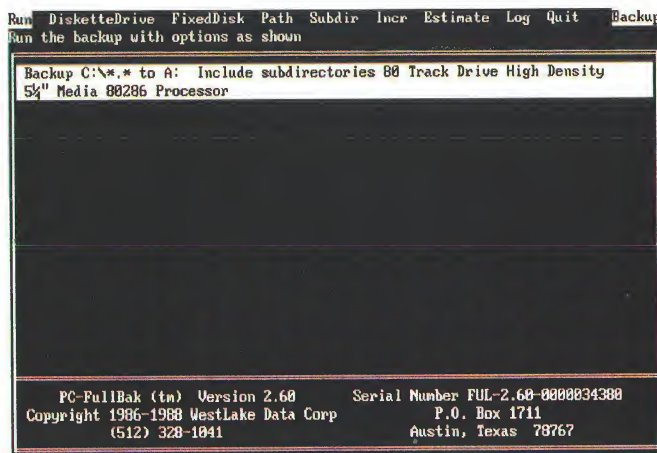
PC-FullBak

Westlake Data Corp.'s *PC-FullBak* doesn't do much—it just backs up hard disks—but it does this quickly and with minimal fuss.

Installation is simple: copy one file from the distribution diskette to whatever directory you want. The user interface is Spartan: no pop-up or drop-down menus here,

just a horizontal menu a la *Lotus 1-2-3* or *VisiCalc*, and no on-line help.

TakeTwo Manager includes a visual file manager which is used to control the backup process.



The 28-page manual has no index and just a few screen il-

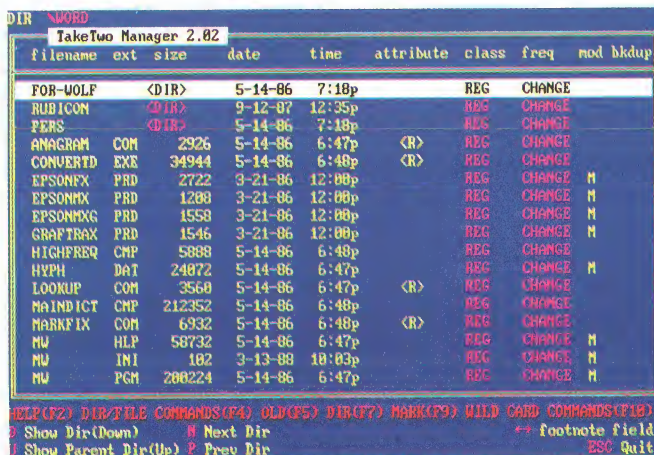
lustrations; the program hardly needs much more than that.

Using *PC-FullBak* is just about as simple as installing it. The program figures out what sort of

Corefast, Version 2.00

- List Price:** \$149
- Requires:** 256K RAM, DOS 2.0 or later.
- In Short:** *Corefast* is a fast, powerful program that gives you considerable control over the backup process. It comes with a visual file manager and is available on both 5¼- and 3½-inch diskettes.

Core International Inc.
7171 N. Federal Hwy.
Boca Raton, FL 33487
(407) 997-6033



system and disk drives you're using, so all you really need to do is move the cursor to the Backup choice on the menu, press Return, and put in your diskettes. Make a couple of menu selections, and you're ready to back up all files that have changed since the last backup. You don't have much more control than that; in most

cases, you don't need much more.

TakeTwo Manager

Installation of United Software Security's *TakeTwo Manager* is fairly simple, especially if you pay attention to the manual. But the current version of *TakeTwo Manager* puts all its files in the root directory; the manual says

**A backup program
does what most
fad diets only
promise: it makes
daily discipline
almost painless.**

you can copy them to any other directory, but in the meantime, you're stuck with the clutter. (Reportedly, this aspect is being changed for Version 2.03.) Installation leads directly to the first full backup.

The user interface is adequate. *TakeTwo Manager* includes a visual file manager, which seems as important a part of the program as the backup itself, and you use it to control every aspect of how often a file should be backed up. This information is always displayed, which makes for a somewhat cluttered screen.

Fastback Plus, Version 1.01

**List
Price:** \$189

Requires: 448K RAM,
DOS 2.1 or later.

In Short: *Fastback Plus* is both ultrasophisticated and easy to learn, offering logical drop-down menus at three levels and outstanding on-line help. It is available on both 5¼- and 3½-inch diskettes.

Fifth Generation
Systems Inc.
1322 Bell Ave., #1A
Tustin, CA 92680
(714) 259-0541
(800) 225-2775

Intelligent Backup

**List
Price:** \$149.95

Requires: 380K RAM,
DOS 2.0 or later.

In Short: *Intelligent Backup* offers ample flexibility, including the ability to back up disks on a local area network. It comes with a visual file manager and is available on both 5¼- and 3½-inch diskettes.

Sterling Software Co.
Software Labs Division
202 E. Airport Dr. #280
San Bernadino, CA 92408
(714) 889-0226

PC-FullBak

**List
Price:** \$59.95 (5¼ disk);
\$69.95 (3½ disk).

Requires: 128K RAM (640K recommended),
1 floppy disk drive,
hard disk,
DOS 2.0 or later.
PC-FullBak stands out for simplicity and value. It backs up hard disks quickly and efficiently without a lot of fuss.

Westlake Data Corp.
P.O. Box 1711
Austin, TX 78767
(512) 474-4666

TakeTwo Manager, Version 2.02

**List
Price:** \$139

Requires: 178K RAM,
DOS 2.1 or later.

In Short: *TakeTwo Manager* includes a visual file manager that lets the user control every aspect of the backup process. Restoring files to a hard disk other than the one they came from can be complicated. The program is available on both 5¼- and 3½-inch diskettes.

United Software
Security Inc.
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Utilities



For simplicity and value, try **PC-FullBak**; it's priced like a Hyundai and runs like a BMW.

On-line help explains menu choices. With *Take-Two Manager*, it is complicated to restore files to a hard disk other than the one the files came from—or to a different partition on the same hard disk.

A couple of irritants: The program doesn't discard accumulated keystrokes when you're scrolling through the list of files, which means it beeps at you up to 15 times when you crash into the top or bottom of the list. And you can't use the left and right arrow keys to move through the list of directories and subdirectories; you must use U and D (for Up and Down), which means that you're constantly shifting from the numeric keypad to the main keyboard.

Do Your Part

Backing up your hard disk is a lot like losing weight: you know you should do it, but it requires daily discipline and is easy to put off when you're busy or tired or stressed out. A backup program does what most fad diets only promise: it makes daily discipline almost painless. You still have to shuffle a few diskettes, but the job

is quick, and a full backup takes less than a quarter of an hour.

Any of the backup programs described here will work, but a couple stand out.

For simplicity and value, you just can't beat *PC-FullBak*: it's a snap to install and easy to learn, and it does its job quickly and cleanly. *PC-FullBak* is priced like a Hyundai but runs like a BMW.

If you want more-precise control over what files are backed up and how often, together with a gorgeous user interface and superlative on-line help, then pick up *Fast-back Plus*. If there's a bell or whistle it doesn't have, chances are you don't need it.

And back up your files every day. After you buy one of these programs, you will have run out of excuses. ■

Van Wolvertan, a Montana-based writer, is author of the best-selling books DOS:Running MS-DOS and Supercharging MS-DOS.

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gandalf AND blade

The air in the kitchen was thick with things unsaid. The three of them sat at the table, nursing hot drinks. Alan and Susan sipped coffee. Justin slumped over his mug of spiced tea. He didn't look at his mother and stepfather. And they bit back all the things they wanted to shout at him. All the fearful, angry, loving things parents feel for a child who has put himself in harm's way.

Alan placed his cup on the table with exaggerated care. "Well," he said, "at least you had a helmet."

Justin raised his mug. As he drank, he flashed Alan a look of raw anger. But as quickly as it came, it was gone. When he lowered his mug, his features were once again expressionless. Not blank, exactly. But controlled, in a way a 17-year-old's shouldn't be.

"Yeah," Justin said. His voice was as controlled as his expression. But he radiated bottled fury, as he had for the last two years. Ever since Alan had come into his life.

ILLUSTRATION BY JULIAN ALLEN





**A father's last chance
to reach out to a
troubled stepson is a
friend called "Mac"**

**FICTION BY
STEVEN L. THOMPSON**

Silence enveloped them again. Outside, the night was quiet.

"You should get some sleep, Justin," Susan said. Alan glanced at her. The strain told in her eyes.

"Okay," Justin said. He rested his forearms on the table, cradling the mug, staring into it. Alan wanted to put his arm around Justin's shoulders and say, hey, no problem. The Honda doesn't matter. You matter. But he couldn't do it. Any more than Justin could let him do it.

Justin straightened up. He smiled the phoniest smile imaginable. "Catch a few zees. Good idea, mom." He hobbled to the kitchen doorway and left the room.

Much later, Alan and Susan lay sleepless in bed, not touching, just lying still and separate, recalling the awful moments. The call from the emergency room, telling Susan that her only child was unconscious, the victim of a motorcycle crash. The police, telling Alan at the hospital that Justin was obviously driving under the influence. But that be-



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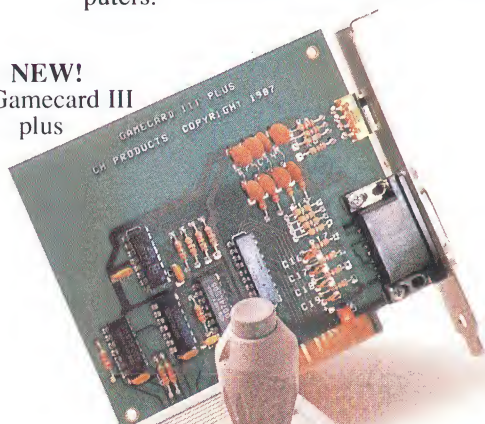
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cause he'd injured only himself, they wouldn't charge him. The endless waiting, while the ER staff worked on him, finally pronouncing him miraculously unhurt except for bruises and cuts. And Justin himself. Unwilling to tell them anything.

"That damned bike," Susan said, staring at the ceiling. "If only you hadn't given him that motorcycle."

Alan rubbed his eyes. They felt like gritty marbles. "Yes. Well, I did."

"Yes, you did," she replied. Bitterness hissed through the words. Alan turned on his side and looked at her. In the semidarkness, her features were invisible. But her tension wired the room.

"Hey," he said. "Remember, it was Latimer's idea. Right?"

She said nothing.

"Listen. We talked about this enough before we got it. Latimer claimed Justin had to express himself through something he chose himself. That was the Honda. Come on. You agreed to it then. Do you think now it was wrong, just because he had a spill?"

A pause. "I was desperate," she said. "I still am." She paused again. "He's so unhappy."

"He's unhappy? What about us? We're not exactly having a ball, are we?"

She didn't answer. She didn't have to. Alan knew the answer. It wasn't working. Alan had entered the relationship knowing that dealing with Justin would be difficult. Susan had made that clear in telling him about her short second marriage. Justin had hated Gene. Susan didn't know why. Nobody knew why, exactly. All anybody really knew was that Justin's biological father was somehow at the root of it. And he was long gone, divorced from Susan and completely uninterested in his son.

The therapists agreed that Justin suffered from his father's rejection. They didn't agree on what to do about it. Susan and Alan had tried everything. Including Dr. Latimer's theory. But the Honda hadn't worked any better than the other schemes. Justin remained hostile to Alan. And his enmity was slowly

poisoning the marriage.

Alan was determined not to let it happen, but he was an engineer, not a psychologist. He was also a man whose own first marriage had crumbled for reasons he still did not understand. His guts twisted with the thought of what might befall them all if he couldn't somehow reach Justin. Susan loved her son. Alan knew she loved him, too. But he also knew that if she had to choose between him and Justin, she would choose her son. Again.

He reached out to stroke Susan's hair, but she turned away. He groped for the right words, but before he could find them, exhaustion overpowered her. She was asleep.

Alan couldn't relax. He slipped out of bed, put on his robe, and went quietly down the hall to his study. The study was jammed with books and the support gear needed for his machine. He closed the door and eased himself into the ergonomic chair that faced his computer. The AT clone seemed to power up by itself as his hands followed the routine.

The computer whirled, chirped, buzzed, and muttered. He stared through the amber monitor as it flashed various familiar messages at him. Its shell program asked him what he wanted to do. The idea processor seemed to appear almost as quickly as he selected it from the menu.

Most of the time, he used the processor as a means of untangling the often conflicting priorities of the projects he worked on. The projects were complex, and so were the conflicts. The software's job was to clarify the clashes. It was basically a list-comparison program. He called it Socrates.

He hadn't used Socrates on the problem of Justin before. It had seemed unnecessary—until tonight.

Socrates asked him to state the problem. The cursor flashed at him while he thought.

"What we have here," he typed, "is a failure to communicate."

Alan frowned at the single line of glowing amber type on the screen. He began, finally, to make a list under the heading "Failure to Communicate." He split the screen, giving the left-hand side the subhead "Alan" and the right-hand side "Justin." The object would be to list random data about himself and Justin as it occurred to him.

He lost himself in the process. Hours passed, but he was unaware of them, as always, when he was in symbiosis with a computer. When he had finished entering all the descriptors he could think of, he be-

**"He's unhappy?" Alan replied.
"What about us?" She
didn't answer. She didn't have to.
He knew if it came to a choice
between him and Justin, she would
choose her son. Again.**

gan to arrange them. In a few moments, he had a lengthy file describing himself and Justin, term for term. There were fewer areas of commonality than he'd thought.

He scrolled down to the "recreation" category. Justin's idea of a good time was either to go somewhere on his bike and hang out, or to get wasted with his buddies and crank up the music on the CD player until the walls warped, sometimes even accompanying the CD with his Mac, wired into an amp big enough to—

His Mac. Alan sat up and stared at the screen. He had completely forgotten Justin's Macintosh. Like most of his pals, Justin had a powerful computer. To them it was de rigueur, like a Walkman or a private phone line.

Something about Justin's private telephone line gnawed at Alan. He sought the reason on the screen. The cursor still pulsed on the capital M of Macintosh. The name of the computer rolled around his mind, firing memories and images.



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Then, slowly, the words and images coalesced. A plan began to emerge. As he watched it play out in his mind, his pulse quickened. Its appeal was obvious. But though it held the promise of a solution, it was still a gamble with high stakes. He forced himself to be as coldly analytical about it as about any professional project. He organized the key elements and let Socrates help him arrange the pros and cons.

The comparison pinpointed the many traps that lay hidden like mines. Each could derail the plan and leave him in an even more awkward position with Justin. But the real threat lay at the end. Even if the plan led precisely to the conclusion he wanted, there was the possibility that the result would shatter any chance he and Justin might have to share something besides an address in the suburbs. And that potential chilled him, because it might precipitate the marriage meltdown he was trying to stop.

He stood up and paced back and forth in the small study. Occasionally, he stopped and stared at the computer screen. But it never changed. And time was running out. None of the psychologists, psychiatrists, or family counselors had been able to find a way to break the chain of misery in which Justin's problem entangled them. Alan knew that now it was up to him to help Justin out of his inner prison. The plan offered a chance. And it was all he had.

Alan sat down again and faced Socrates. He forced his fears aside and began to refine the details. The neighbors' dog barked at the dawn before he was through. But when Alan switched off the PC, he allowed himself to hope.

When Susan awoke, still distraught, he shared his hope, but not the entire plan. He knew she would distrust its complexity. He distrusted it himself. But by the time Alan left for work, she had agreed that he would proceed with it. In return, he agreed that the Honda would not be

replaced with another bike, and that Justin would be restricted to occasional use of their second car.

It was midafternoon before Alan got a break from a marathon meeting that plodded through lunch. He spent the next few hours shopping. Well after rush hour had plugged the roads, he headed home.

When he arrived, he saw that their

His Mac. Alan had completely forgotten Justin's Macintosh. The name of the computer rolled around his mind firing memories and images. A plan began to emerge.

Toyota was gone. Susan met him in the kitchen.

"Justin take the Toyota?" he asked.

"Yes. I told him about the Honda. He wasn't happy, but I think he expected it."

"Ah. Well, I've got something here that might make him feel better. Is he coming home for dinner?"

"He promised. By seven-thirty."

The atmosphere at dinner was strained. Alan asked how Justin felt. He grunted. Alan asked whether the word had gotten around school that he'd crashed. He grunted. Alan gave up, until Justin laid down his fork and said he was going downstairs.

"Hold it," Alan said.

Justin looked at him. He waited.

"I got something for you today. Sort of a replacement for your bike, in a way. The package is over there."

Justin looked into the living room and saw the small boxes. He walked slowly over to them, as if expecting a booby trap.

He sat down and examined them, box by box. Then he stood up, gathered them, and glanced back in Alan's direction. "Thanks," he mumbled.

"It's a modem," Alan said. "For

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CHAPTER ONE
THE BLACKEST HOUR IS MIDNIGHT

It was not a night fit for man or beast what with the sky being as black as ink and it starting to rain like cats and dogs. As if things weren't bad enough Jeffrey Whipple had to climb all the way up to the top of Bald Eagle hill in his snakeskin boots so new their smell reminded him of a car he once leased in Flagstaff, Arizona just to check things out because earlier in the day a message had gotten through that there was going to be trouble this night so he was feeling ominous as the dry wind whipped up the dust around his feet and wondering if he should go on or go back to camp when suddenly, he heard a twig crack behind him or thought he did but as he turned he ... it see anything except the black bleakness of the

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your Mac. And software. Along with a subscription to an electronic mailbox service. It's all ready. I even got your user ID set up. You just plug it in, dial up, log on, and go."

"Yeah," Justin said. Then he went downstairs.

Alan saw little of Justin during the next week. Justin faced not only the problem of mobility, but midterms, and Alan was yoked to his office. Their home life consisted of brief encounters and little discourse. But he knew the boy was using the modem.

Alan judged that it was time to act when he overheard Justin telling a pal that he didn't want to join them for cruising because he was logged in to a game he didn't want to miss. The next day at lunch, Alan closed his office door and punched up his computer's communications program. Like the other senior engineers, he enjoyed the privilege of a private PC.

He logged on to his e-mail service, checked his mailbox, and then called up Justin's ID. Because he was a power user of the service, he'd been able to get Justin's box cheaply and to ask for a memory as large as his own box's—one megabyte, sufficient not just for book-length messages, but also for big data and program dumps. Moreover, he'd set up a second mailbox for himself, specifically for Justin's use.

The service allowed a user to greet callers with a customized message. Alan grinned as Justin's appeared on his screen.

"This is Blade. If you got something to say, do it now."

Alan's grin widened at the swagger of it, so different from Justin's home persona.

"Dear Blade: This is a random call. I got your ID from a worm runner. I'm looking for people who like to play tough games. If you're tough enough, let me know and we'll play." He signed it, "Gandalf," and added his user ID.

He didn't check his "Gandalf" mailbox for two days. When he did, he found a message.

"Gandalf: So you got a hot game? I'm your man. Ready and waiting.

Blade."

A shock raced through Alan as he read the lines. Justin's words were so cocky, so glib, and so unlike anything he had ever shared with Alan. For a long while, Alan simply stared at them. Then he called up the Mystery of the Tomb and transferred it to Blade's mailbox. He signed off feeling as if he had embarked on a great and dangerous adventure.

For a week there was nothing in Gandalf's mailbox. But Justin disappeared every night into his room. He rarely asked to borrow the Toyota. As Susan and Alan had their nightly discussion in bed, Susan said she hoped it meant he was studying for his midterms. Some part of Alan hoped so, too. But a larger part hoped Justin was trying to solve the Mystery of the Tomb. Yet the days passed, and no message appeared in his Gandalf mailbox.

The urgency of his work almost made Alan forget about the game. But after an exhausting day spent locked in meetings with clients, he remembered to call up the mailbox. A message awaited him.

"Gandalf: This game can't be won. Over and out. Blade."

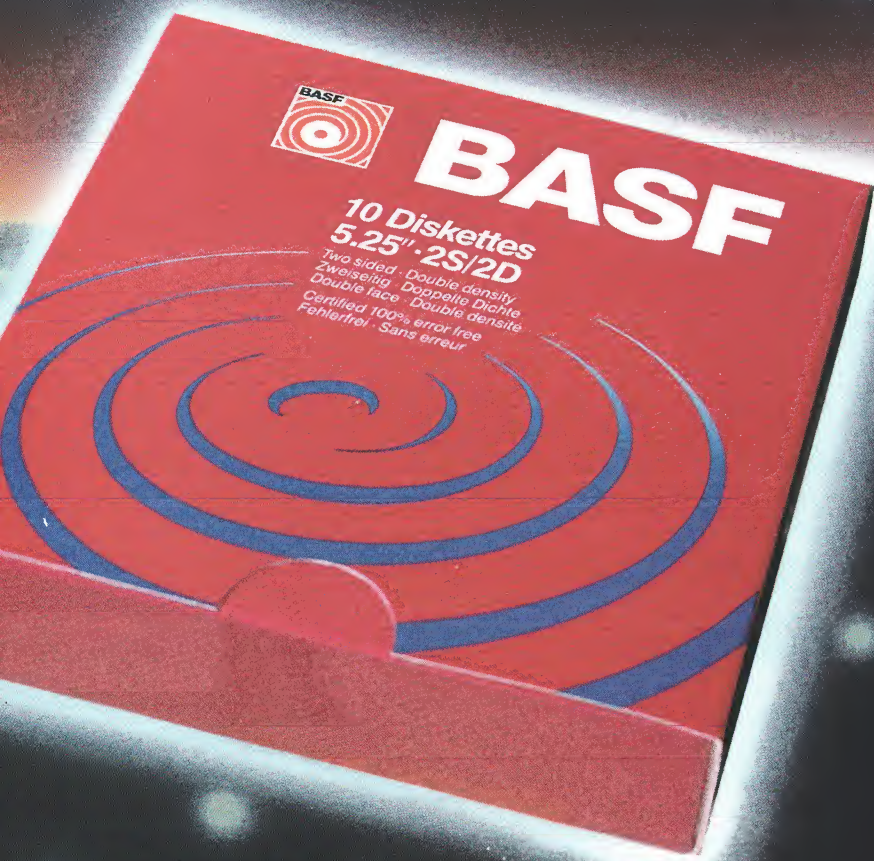
Alan smiled. He sympathized with Justin. It had taken him and his colleagues days to solve the mystery. He'd hoped the game would lead to this. He quickly keyboarded his reply.

"Dear Blade: You're wrong. The game can be won. I told you the game was only for the smartest and toughest. If you want the solution, let me know. Gandalf."

At home that night, Justin didn't even bother with dinner. He stayed in his room, which throbbed with rock music. Alan knew he was running the solution. He felt a twinge of jealousy for Gandalf emerging. But the first thing he did the next morning was check his mailbox. Sure enough, Blade had left him a note.

"Okay. So you had a tough game. Try this one. Nobody finds the Lost Mine of Zark. Blade."

Alan immediately called up the game and spent the entire morning locked in combat with it. By noon



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he found the lost mine and triumphantly slapped the solution into Blade's file.

Blade's reply the following day was all Alan hoped for. He admitted Gandalf had solved the problem and asked him how he'd managed it. Alan composed his response with great care, ending with the casually stated suggestion that since they both enjoyed the same games, they might want to engage in a real-time rap session soon.

When Blade failed to respond, not only the next day but for the following week, Alan wondered if he'd pushed too far, too fast. Justin had suddenly started spending a lot of time out with his friends again. On Saturday, Justin took the Toyota and brought it back after midnight with a crunched fender and a speeding ticket, neither of which he would discuss when he awoke at three the following afternoon. That night, Susan told Alan she hoped he was making some progress with his plan. He didn't know what to tell her.

Alan couldn't take the time to check Gandalf's mailbox until late Monday afternoon, and when he did, he expected it to be empty again. But there was a note from Blade, agreeing that they should do a real-time connect. He suggested Wednesday night and included his home phone number.

Alan sent his reply, keyed in his office modem number, and set the time for nine o'clock. He felt like a man walking a tightrope. He knew the slightest misstep could end everything.

Wednesday seemed to arrive in minutes. Alan had arranged to work late, as he often did. His communications software auto-answered when Blade logged on.

As Gandalf, Alan replied to Blade with a greeting and a query, so that the boy wouldn't have to initiate the conversation. He asked what kind of computer Blade used, and that directed them into the safest conversational territory—equipment. Alan carefully refrained from

asking about Blade's personal life.

It seemed to Alan that only a few minutes had passed when Blade said that he had to go. Alan yearned for the conversation to continue, but he knew he couldn't push too hard. Gandalf agreed. When Blade said they should connect again soon, Alan swallowed and forced himself to slow his reply. Blade dropped off-line and Alan continued to stare at the screen. He saved the conversation to his disk and re-read it. The lump came to his throat again.

The next morning, the deadline for a major proposal drove all else from Alan's mind. It was after four o'clock before he checked Gandalf's box.

A terse message from Blade asked if they could connect that Sunday evening. Alan suddenly remembered he'd promised Susan that he would be home Sunday night, come hell or high water. She wanted to cook a "real" dinner. A family dinner. He pondered the conflict and realized he could connect from his home PC by using the auto-forward feature of his comm software. That way, Justin wouldn't know he was dialing through to his own home.

The Toyota was home when Alan arrived, but Justin was gone. He didn't show up again until late Saturday night. He explained nothing, grabbed a batch of CDs, and disappeared again. In the few minutes he

**Alan felt like a man walking
a tightrope. That night, Susan told
him she hoped he was making
some progress with his plan.
He didn't know what to tell her.**

was in the house, Susan managed to extract his promise that he'd be there for dinner the next evening.

He made it, barely. Throughout dinner he was silent, except for monosyllabic answers to specific

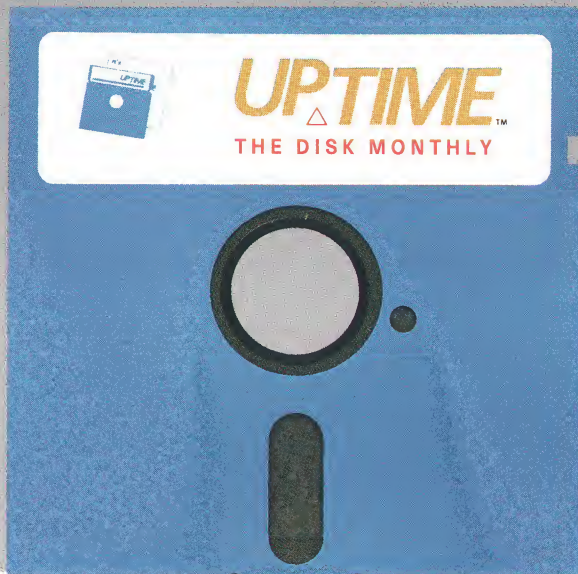
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questions. Soon enough it was over and he was gone, back to his room. The floor began to pulse with heavy metal rock.

Alan started to gather the dishes, but Susan waved him away, obviously upset by the dinner's failure to bring them all together. Helpless, Alan went to his study, powered up his PC, and waited.

It took forever for the appointed time to arrive. But almost to the

second, Blade's call was forwarded from Alan's office. Alan had figured he might have to coax Justin into the conversation. But the opposite happened; Alan watched, surprised, as Blade's words skittered across the screen, much faster than before. He wanted to know about Gandalf.

Alan replied cautiously. Then he encouraged Blade to talk about himself. It wasn't easy, at first. But Justin warmed up and soon had re-

vealed a lot. He'd even admitted his age. Alan knew that was no small matter for a teenager. He took it as a signal and asked about Blade's family.

The cursor flashed at him for a long heartbeat. Then Blade dropped off-line.

CALLER DISCONNECT, Alan's software told him. He just looked at it, dumbfounded. He reread the last lines and cursed himself for miscalculating. Justin obviously wasn't ready for intimate details yet. He rested his hands on the base of the keyboard and wondered what to do next.

Before he decided, the computer's internal modem beeped and sent out its shrill greeting. His screen cleared itself, and **CONNECT 1200** appeared on it. This time, the words came more slowly. Gandalf? U there?

Here. We got disconnected.

I did it. Hard to explain.

Explain what?

Me. Family.

Same here.

Really?

Really. Lots of problems.

Ever get you down?

All the time.

Me too. Nobody cares but my friends.

Folks don't?

Okay mom. Old man never listens.

Neither does mine.

Yours real?

What?

Real father. Not stepfather?

Yes. Yours?

No. Step.

Bad?

Semi.

How?

Mr. Straight.

All work, no play?

Got it. Down on everything. Major bummer.

Tough guy?

Gives me things.

Maybe he can't connect.

No way. Cares about THINGS & work. Not about ME.

U sure?

Wants me to GO AWAY. Does NOT give a DAMN.

The words jolted Alan. He realized that this was it, the reason he'd become Gandalf. But now that he

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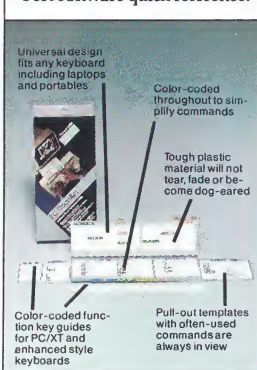
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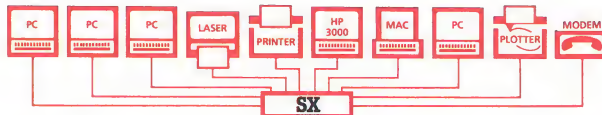
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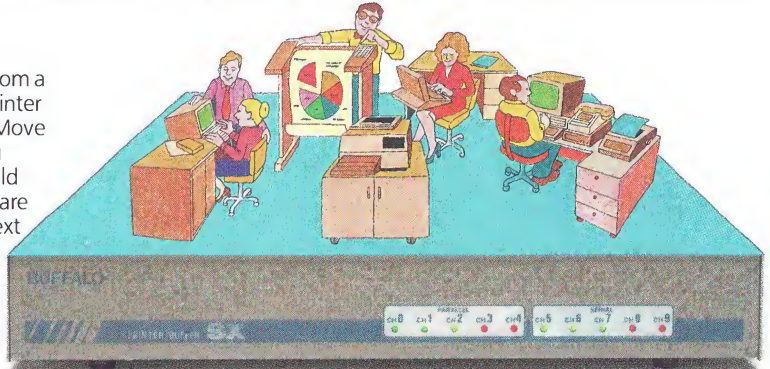
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was here, he didn't want to carry out the plan. He was too comfortable as Gandalf. He scanned the lines on the monitor and fought

foreseen that either.

Alan had done many hard things in his life. He had seen death; he had suffered physical and emotional pain. But nothing he had ever done was as hard as making himself type the words he knew had to come next. He knew the stakes, and he knew how many ways Justin might react. But every confidence Justin shared with Gandalf would make it that much harder for him to share them with Alan. He had to act. Now.

His hands felt as if they belonged to someone else as he made them work.

"You're wrong, Justin," they typed, "I DO care about YOU. I want to listen. Will you talk?"

Alan dropped his leaden hands and stared at the screen. His mouth was dry, his palms were wet, his

heart thudded like a laboring engine. A strange vertigo gripped him as he fixed on the flashing cursor at the end of his line.

Finally, after a minute or more, it skipped one space. Then another. And stopped.

He willed it to move across the screen, to record Justin's reply, to keep alive their slender thread of contact.

But it did not move. Not for one minute. Not for five. Alan sat alone in his little study, barely breathing, falling through the endless space behind the monitor, living and dying with each flash of the cursor. And still nothing moved, on the screen or on either side of it.

Until, at last, the door behind him began to open. ■

Stephen L. Thompson, co-author of Wild Blue, contributes to a wide range of publications, including Cycle World and the Washington Post.

A strange vertigo gripped him as he fixed on the cursor. He willed it to move across the screen, to record Justin's reply, to keep alive their slender thread of contact.

confusion. This was a contingency that neither he nor Socrates had foreseen. He knew he could go on as Gandalf, gently extracting Justin's feelings. But it made him ashamed, somehow. And he had not

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SHARE

ALMOST FREE SOFTWARE • By NELSON FORD

Shareware and public domain software are great ways to beat the cost of expensive application software. This is the first in a series of columns that will focus on the best and most interesting of these programs, which you can copy legally from other users, user groups, or electronic bulletin boards or obtain from commercial distributors who charge a minimal price per disk (see the sidebar "Where to Find Qubecalc").

One of the real gems of the genre is FormalSoft's *Qubecalc*, a shareware program that adds a "third dimension" to spreadsheet analysis.

Traditional spreadsheet programs organize data in columns and rows, as in an accounting ledger. They're useful for handling two-dimensional data like that found in expense reports and profit-and-loss statements. With a certain amount of fiddling—using macros and look-up tables—you can make traditional spreadsheets perform financial acrobatics worthy of Harry and Leona Helmsley's best tax accountants.

Yet your view of the data spreadsheets contain is limited to two dimensions, and rearranging the data can be awkward. For example, building a spreadsheet to record details from the pay stubs of a group of employees is simple. But when the time comes to fill out quarterly tax reports, extracting monthly totals and tax amounts for each employee may mean

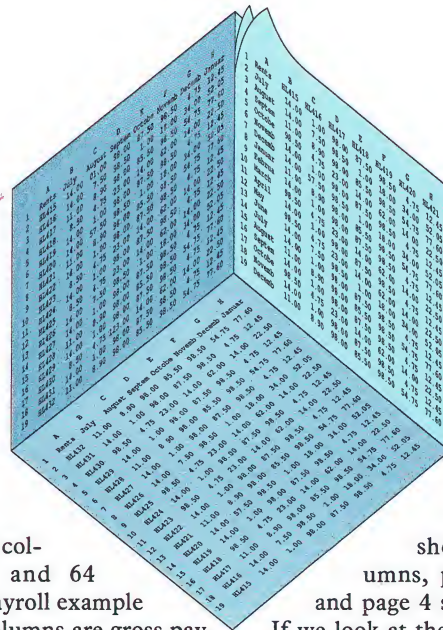
constructing a whole new spreadsheet, writing dozens of new formulas, or building a database. *Qubecalc* helps by displaying data in a third dimension called "pages."

A *Qubecalc* worksheet consists of a data "cube" of up to 64 columns, 64 rows, and 64 pages. Using the payroll example given above, the columns are gross pay, FICA, FIT, and net pay. The rows are employee names. Each week's payroll data would be carried on one page (see Figure 1).

So far, *Qubecalc* resembles a standard spreadsheet. But *Qubecalc* also allows you to view the data from six perspectives (the number of faces on a cube). If you rotate the cube to the left, the columns (payroll data) become pages. If you rotate it upward, what were rows (names) become pages, and what were pages (time periods) become rows, while the columns still hold the payroll data.

Is this facility as useful as it is initially confusing? Absolutely. Stay with us through the illustrations (below).

First, let's change the view from head-on (perspective A)



and look at the data from the perspective of the right side of the cube (perspective B). The columns are now pages. Page 1 displays the gross pay column for each employee for each week of the quarter. Page 2 shows the FICA columns, page 3 shows FIT, and page 4 shows net pay.

If we look at the cube from the bottom instead (perspective F), we see that

A three-dimensional spreadsheet that lets you view data from several perspectives, Qubecalc is easier than it sounds.

the pages carry the information contained in the rows of perspective A. So, page 1 shows the row with the totals for each week. Page 2 shows all the payroll numbers for Dave, page 3 the numbers for Carl, and so on.

Perspectives C, D, and E are the opposite sides of the imaginary cube from perspectives F, A, and B, respectively. Logically, looking through from one side to the other—from C to F—you'd see the same data, but in reverse order. For example, looking from the back side of the cube, you'd see columns 1 through 5 on side A numbered 5 through 1 on side D. Instead of displaying the data this way, *Qubecalc* changes

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Public domain software is free for the taking—whether by copying a friend's disk or by downloading it from an on-line bulletin board. Shareware, is almost but not quite freeware.

It dates back to 1982, when Andrew Fluegelman began marketing his PC-Talk communications program in a novel way. He gave away the disks and asked users who liked the programs to send him a modest fee. You can obtain shareware from authorized user groups, download it from bulletin boards or information services, and find it in shareware libraries.



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SHARE

the rows into columns and columns into rows. Although swapping rows and columns might come in handy, clearly A, B, and F are the most useful perspectives.

Any data that must be recorded over time in the same format is a good candidate for *Qubecalc*—such as financial

**Where public
domain software is
free for the copying,
shareware is almost
free.**

statements (including consolidations), stock market statistics, or a baseball team's individual player statistics by game. If, for example, you were to enter the high, low, and closing stock prices plus volumes traded for a list of stocks every day in perspective A, by switching to B you could view the closing price of every stock on your list for the last 64 days. Changing to the F perspective would show you the high, low, closing, and volume data for one stock for the last 64 days.

WHERE TO FIND QUBECALC

**Recommended Qubecalc Shareware
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**Qubecalc is available on CompuServe (Data Library IBMSW Applications Li-
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groups. You can also get it directly
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gram) to try. The full registration
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(801) 565-0971**

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**Requires: 256K RAM, two disk drives,
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**In Short: A gem of a shareware pro-
gram that adds a third dimension
to spreadsheet analysis.**

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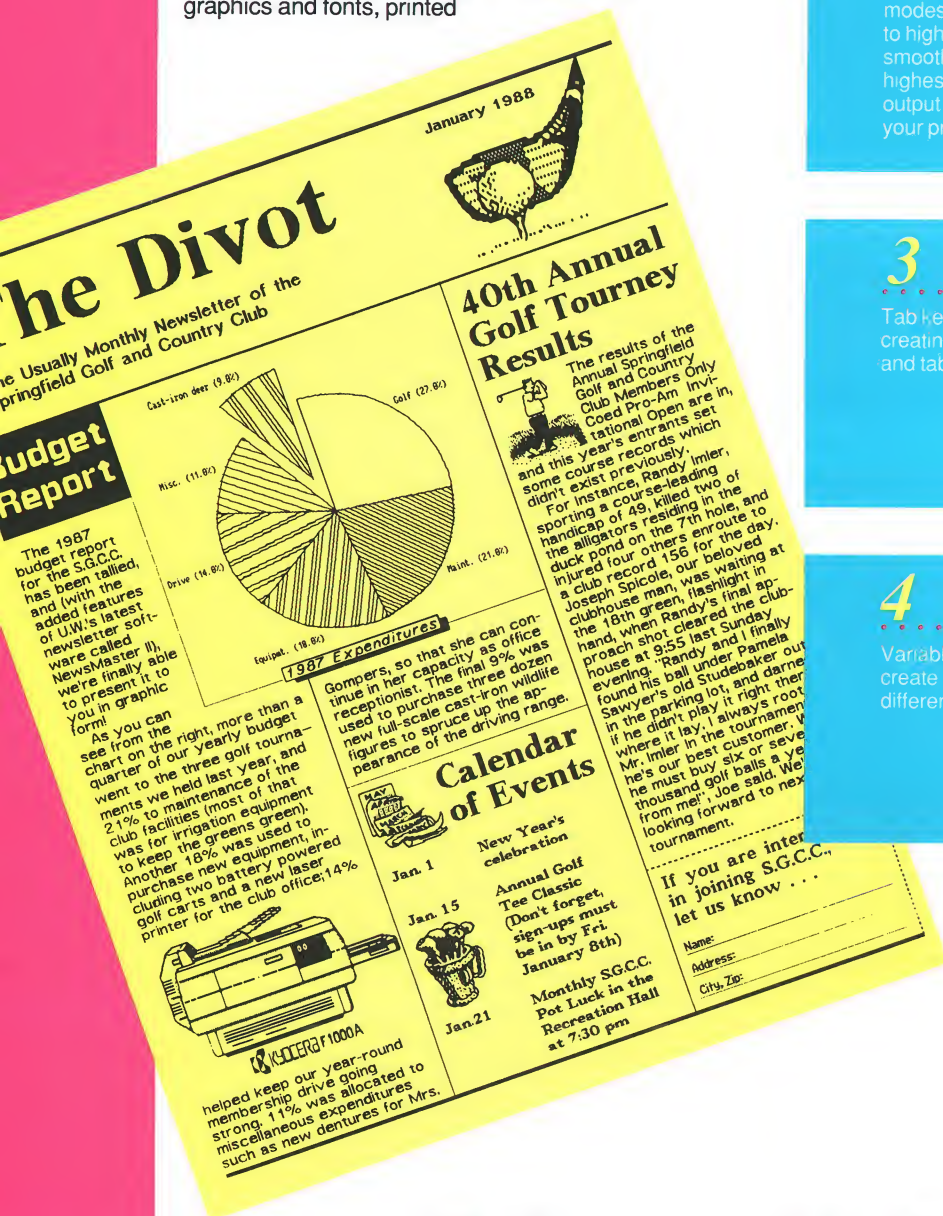
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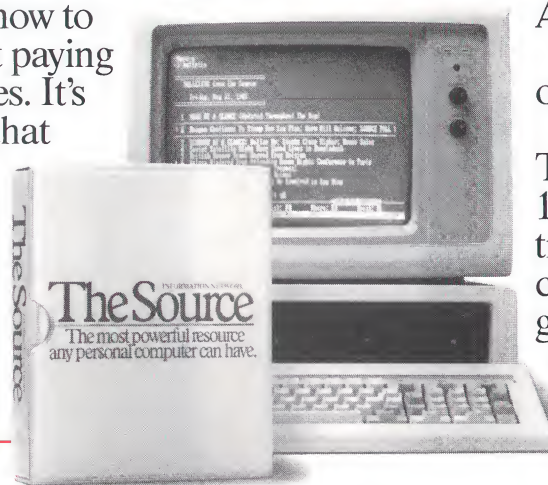
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EURO TECH

FOREIGN INTELLIGENCE • By WILLIAM MACHRONE

The number on everyone's lips is 1992. Throughout Europe, pulses are quickening as the countdown begins. That's the date the trade barriers come down all across Europe and the Common Market fulfills its promise to become one huge free-trade area. And nowhere is the anticipation greater than in the Federal Republic of Germany.

It would be typically American, however, to characterize West Germany as a single entity. Despite the bonds of language and *Kultur*, Germany is many places, each with its own personality.

They call it Silicon Bavaria. The one-time province of cuckoo clocks and lederhosen is Germany's latest high-tech haven. The Eurotech firms are moving south into the ring around Munich, lured by open spaces, Alpine views, a large, well-educated labor pool, and a more relaxed pace. "Relaxed," of course, is a relative term in Germany. The memo paper in my Munich hotel room admonishes, *Verzetteln Sie sich nicht* ("Don't fritter away your time"). But the people are more open, affable, and, well, happy here.

Bavaria has a lot to be happy about these days. Its industrial base has never been stronger. Unemployment is low, and the region is poised for the coming economic revolution. Munich is the tech-educational and research capital of Europe. Electronics giant Siemens makes its headquarters here, as does BMW, not to mention numerous other

high-tech firms.

Regional pride is high, too. People advertise their Bavarianness in subtle ways: leather oak leaves stitched into the lapels of a teenager's oversized jacket, loden-green accents on a businessman's suit, a thick braid at the nape of a modishly dressed woman's neck.

The year of the coming union is already as fraught with meaning in Europe as 1776 is for Americans. It signifies an economic rebirth, the time when the nine Common Market countries will relinquish many national prerogatives in the interest of moving goods and money virtually without restriction. In so doing, they hope to create the single largest consumer market

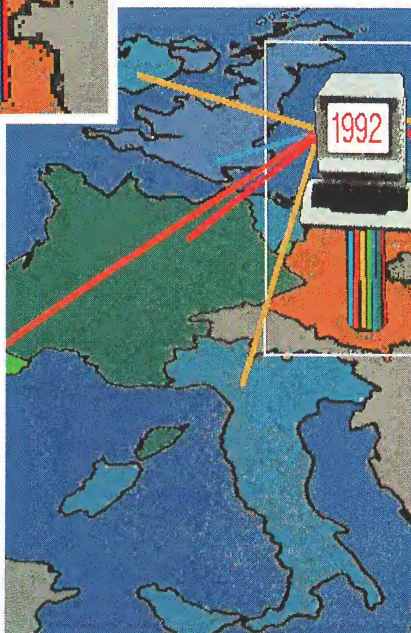
in the free world: 380 million people, with a \$4.75 trillion combined GNP—twice as big as Japan's and marginally larger than the U.S.'s. It won't be easy. Language barriers remain, even after

Silicon Bavaria is Europe's latest high-tech haven for computer and communications systems developers.

decades of polyglot living. Nationalism, too, will be slow to fall, even under the economic pressure of truly free markets.

In Silicon Bavaria, however, the seeds of change have already been sown. Munich is Europe's focal point for ISDN (Integrated Services Digital Network), bringing the digitization of the phone system. Europe is years ahead of the U.S. in ISDN implementation and expects to have 85,000 commercial customers on ISDN by 1990.

The *Bundespost*, Germany's federal post office, also has an ironclad monopoly on telephone, telegraph, and data transmission. Monopolies can be efficient at getting big jobs (such as ISDN) done, but some are accusing them of shortsightedness. ISDN is less than ideal for some forms of high-speed wide-area networking, yet no alternatives will be offered. Multinational companies with their own sophisticated networks would prefer not to be constrained by policies and politics. The European PTTs (post/telephone/telegraph departments) traditionally exercise abso-



lute control over data crossing the borders. Open borders mean open data paths. It will take new equipment and new attitudes to make the new openness happen.

Computers will play a special role in the opening of the borders. Europe has been icon-aware for years. International symbols adorn roadways, public places, shipping containers, and instructions of all types. Computer systems are based on language, and language stops at the border. The market is ripe for the graphical user interface, because images are independent of language. This may be America's most important export to the new Europe.

There are fewer computer *manufacturers* here. And fewer still are as adventurous as their counterparts in the U.S. The European computer manufacturers that do exist tend to sell best in their own countries. IBM, Compaq, Apple, and Dell do well here, but at a price.

Part of the cost of doing business in Europe today is setting up duplicate distribution organizations in each country.

Europeans have traditionally taken a dim view of American companies who treat Europe as a single market, or even those treating Ireland and Britain as an extension of their U.S. market. Successful companies have local nationals running their offices. They pay careful attention to the styling, packaging, and documentation of their products. European date conventions, for example, are important for software, as are idiomatic translations of everything from packaging to on-line help.

After 1992, distribution will be more streamlined. It will be easier to do business with Europe when trade barriers fall. If nationalistic markets get submerged in the larger pan-European market, however, there will be good incentives for more Euroclone PCs. Europeans admire the pioneering spirit of

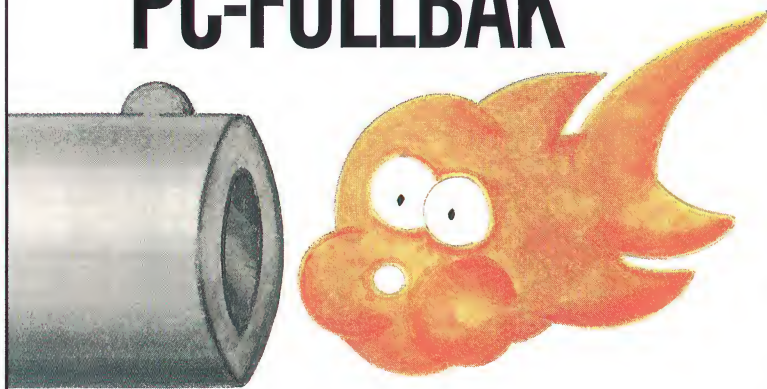
fast-moving, innovative companies like Dell. As continentalism replaces nationalism, Europeans will create a new breed of European heroes. The Common Market may come to regard U.S.-built machines as detrimental to the pan-European economy. Thus, American manufacturers may have to make and market machines in Europe.

For hundreds of years the crucifixes atop Munich's cathedrals have dominated its skyline. Today, a new cruciform shape, the tower crane is an icon of prosperity.

A new Renaissance awaits a united Europe. The last one defined mankind's place in the universe: God ruled the heavens, man ruled the earth. The next one will define Germany's position in Europe's new role in the world economy: first among equals. ■

William Machrone is editor and publisher of PC Magazine.

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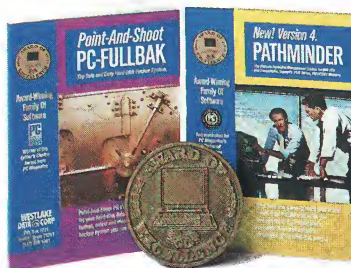
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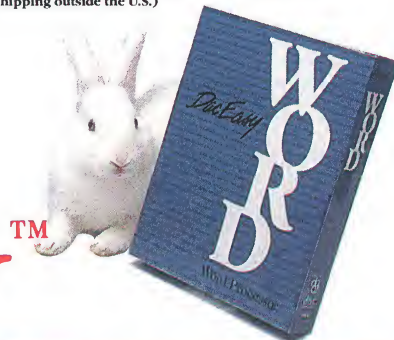
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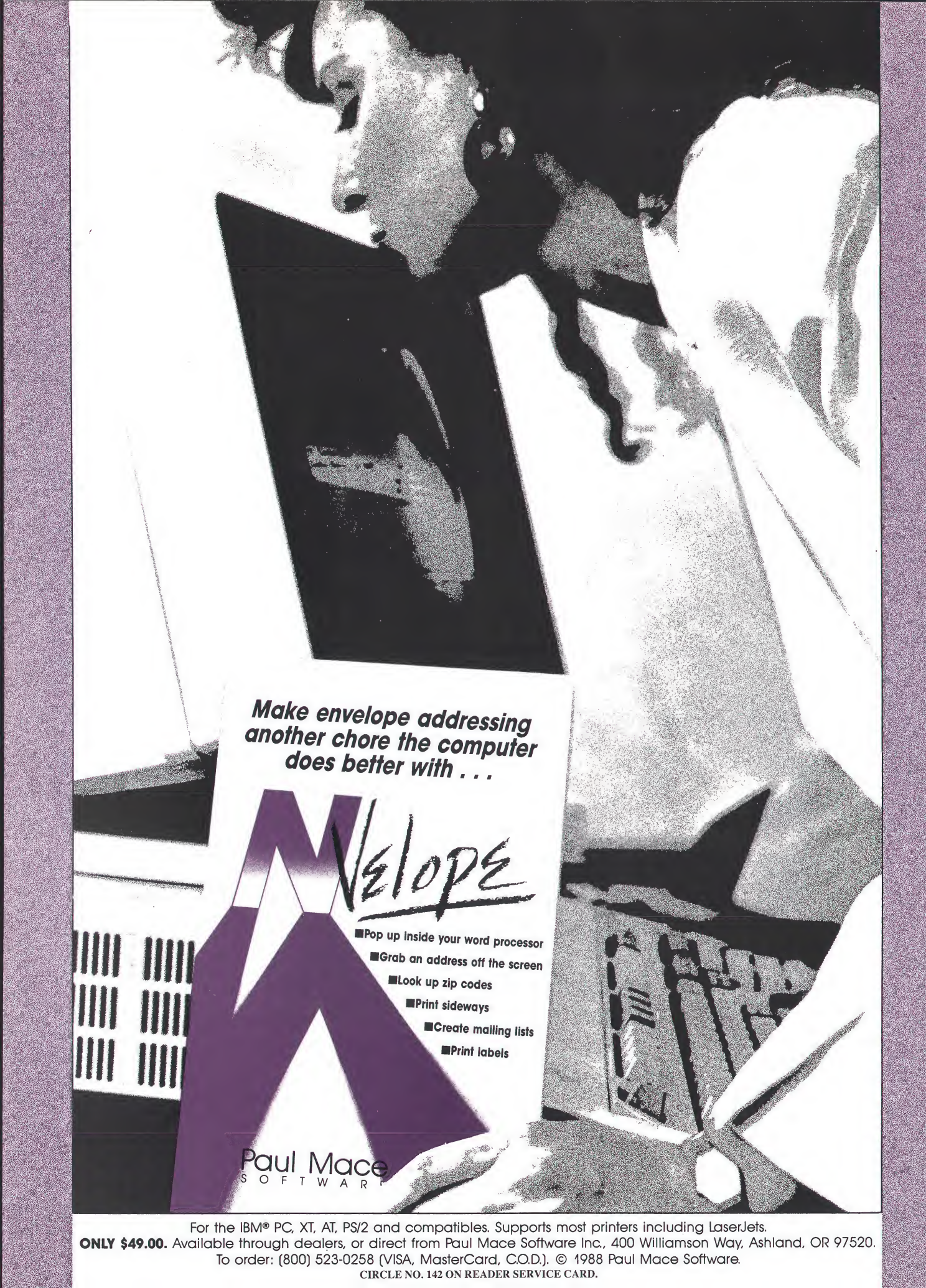
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A high-contrast, black and white photograph of a woman with dark hair, wearing a light-colored top, looking down at a computer monitor. The monitor displays a dark image with some light-colored shapes. The overall style is grainy and artistic.

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WIRED

ONLINE WITH THE WORLD • By PETER H. LEWIS

For the sake of argument, imagine I am totally outraged by a defective widget made by the American Widget Works in Ludd, Texas.

I intend to give those Luddites a piece of my mind, and I don't want to lose this elevated state of paroxysm by fumbling through a phone book, looking for the area code, guessing which godforsaken, snake-infested region of Texas the company might be hiding in, calling Directory Assistance, digging frantically for a pencil, scribbling the number, dialing it, getting a busy signal, dialing it again, getting the wrong number, redialing Directory Assistance, and finally getting through to the rude receptionist who hangs up on me.

So instead, I reach for my keyboard, tap Alt-F1, and—pop!—I'm in *Hot Line Two*, the most useful memory-resident program I can recall.

Hot Line Two, a \$99 program from General Information of Kirkland, Washington, is an electronic national telephone book with 10,000 major listings and addresses, a private phone directory that can double as a simple database, and an auto-dialer. It actually enhances the value of my telephone, and for someone who spends as much time on the phone as I do or for anyone who must make more than a handful of calls a day, it is, in fact, Required Software. Dial M for marvelous.

Instead of repeatedly redialing a busy number, I can instruct *Hot Line Two* to dial it for me every 100 seconds, while I continue to word process. If there's no answer within 45 seconds, the program hangs up. It also turns my computer keyboard into a numeric keypad for quick dialing should I need it. And I can assign frequently dialed numbers to single function keys.

Hot Line Two does have its weaknesses, of course. For example, it can't think up a clever rejoinder to a rude

secretary. On the other hand, it can make her life miserable by automatically redialing her number every 30 seconds for the rest of her life.

General Information has figured out a way to compress *The National Directory of Addresses and Telephone Numbers*, which is rather formidable in traditional telephone-book form, onto a single floppy disk. The numbers and addresses are for large companies, government offices, hotel and airline reservations

features such as cursor dial, which can seek a telephone number from the middle of a word processing document and then dial it automatically. It also accepts numbers "dialed" from the computer keypad, and it can assign frequently called numbers to designated keys, such as Alt-B for "Bookie," which probably saves a few microseconds.

It is as an information source, though, that *Hot Line Two* really lights up. Ma Bell learned long ago that any

**Hot Line Two is not only fast;
its directories are a bargain source of
information for the information age.**

lines, law firms, banks, computer companies, trade associations, and other organizations.

When moved to a hard disk, the national directory eats 1.2 megabytes of RAM. For those who lack that amount of space or who have a floppy-only system, *Hot Line Two* includes a diet version that consists of 5,000 entries (without addresses).

I also use *Hot Line Two* as a personal super Rolodex, storing, in a separate directory, the names, numbers, addresses, and related factoids that I need on a routine basis. I haven't yet hit a limit on how large the supplemental directory can be without a degradation of speed. If I do, *Hot Line Two* permits the creation of additional subdirectories, although only two can be active at once.

As databases go, *Hot Line Two* is rather feeble. To compensate, it works tightly with *dBASE* and *Lotus 1-2-3* files, grabbing numbers and information as needed, and it can, in turn, export information into mail-merge or other programs to create mailing lists and invoices.

As auto-dialers go, it is snazzy; it has

stooge can build a cheap telephone and offer gateways to the long lines, but Directory Assistance is precious stuff.

General Information offers, for \$49.95 apiece, specialized supplemental directories of roughly 6,000 to 9,000 listings each: one for computer and high-technology companies, one for the travel industry, and one for advertising and public relations. How much would you pay for all the names and numbers in your area of interest? Ma Bell often charges 50 cents a number through Directory Assistance. You'll have to put your own value on your time, but for most people faster is better. *Hot Line Two* is not only fast; it's a bargain source of information in the information age. ■

Hot Line Two

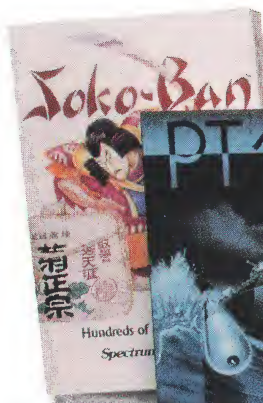
List Price: \$99.00; specialized directories, \$49.95 each.

Requires: 84K RAM, one disk drive (hard disk recommended), DOS 2.0 or later.

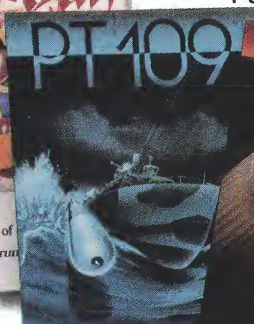
General Information Inc.
401 Parkplace, #305
Kirkland, WA 98033
(206) 828-4777

BUY ONE.

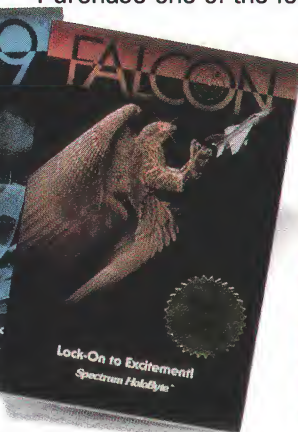
Purchase one of the following titles from your local dealer.



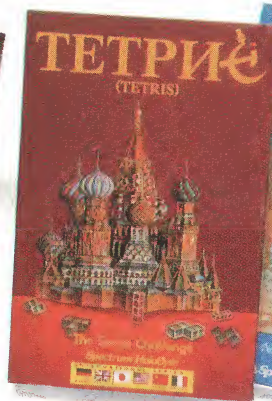
Soko-Ban
Action Strategy Game.
IBM, Apple II, and C-64



PT-109
Torpedo Boat
Simulation. Macintosh



Falcon
The F-16 Fighter Simulation. IBM/
Tandy 1000 and Macintosh



Tetris
The Soviet Challenge. IBM, Apple II/IGS,
Macintosh, Macintosh II, and C-64



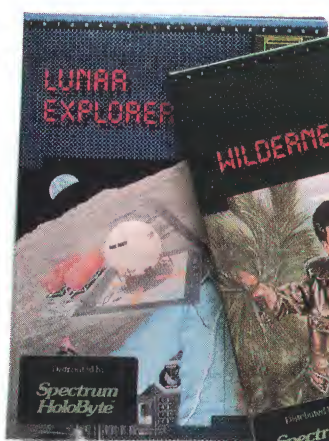
Dondra
Animated Graphics
Adventure. Apple II/IGS and C-64



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Collection of Solitaire games. IBM/Tandy 1000,
Macintosh, and Macintosh II

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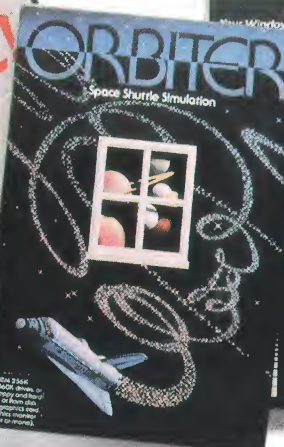
Lunar Explorer
Lunar Landing Vehicle Simulation. Apple II



Wilderness
Survival Simulation. IBM
and Apple II



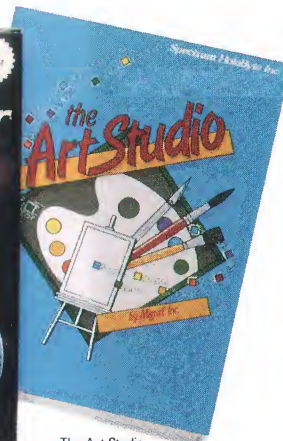
Intrigue!
Mystery Thriller.
Apple II and C-64



Orbiter
Space Shuttle Simulation. IBM and Macintosh



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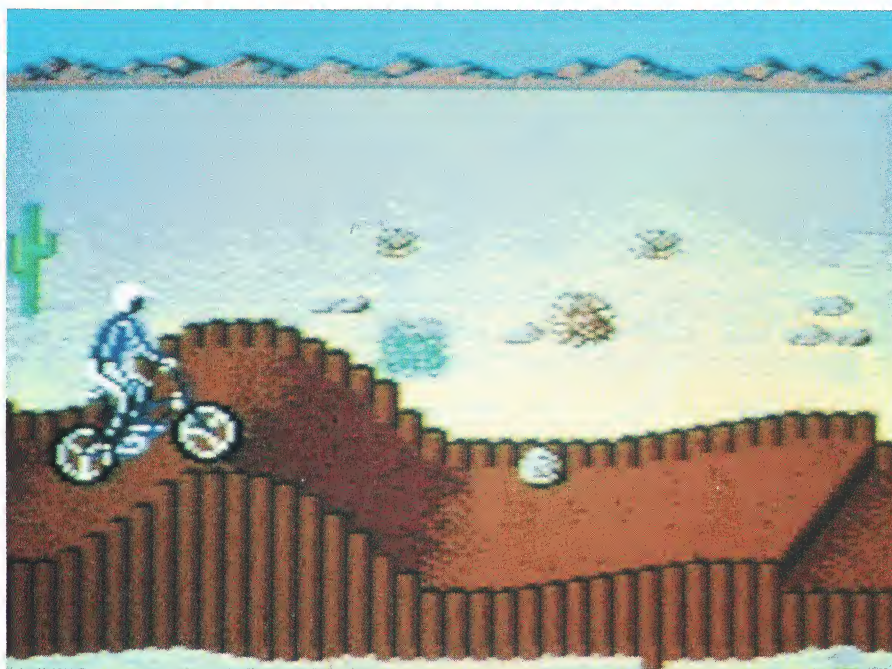
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FUN!

GAMES COMPUTERS PLAY • By MICHAEL KNEPPER



BMX Bike Racing is just one game in California Games. The other six arcade-style games let you experience the sunny California play-style. You can skateboard, surf, roller skate, play foot bag, and sail a frisbee. The graphics are good, and from one to eight players can play.

Like many of the newly computer-literate, I have a computer, but I don't know that much about it. Oh, I know what it means to boot a disk, what RAM and ROM stand for, how to work a modem, and how to use a word processing program. But until recently I'd never played a game on the computer—not even a single set of Pong.

My fun muscles are unwearied by hours of white-knuckled joystick-clutching, so who better to review computer games? At least, that's how the editors of

he said with emotion.

First, a basic truth: the instructions for computer games are written by people who think you and I know as much about this stuff as

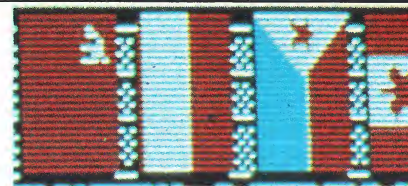
One nerd means you probably wouldn't be embarrassed to admit to playing this game in cocktail party conversation.

they do. We don't, and that can make figuring out how to operate a game an exercise in frustration, which, in turn, can significantly reduce the fun quotient. That brings us to the three criteria I consider of prime importance in reviewing a computer game: Is the instruction book easy to understand? Is the game relatively easy to operate? And, is it fun? I've ranked the games in each of these areas using the nerd quotient.

The fewer nerds, the better. One nerd means you probably wouldn't be embarrassed to admit to playing this game in cocktail party conversation. Three nerds means you probably would. Five nerds means it's so dumb, it will bore you into a stupor and/or you'd be embarrassed to tell your spouse you're playing the game.

PC/Computing explained it to me. But before getting into review mode, a word about objectivity. Make that four words: I don't have any. I picked these particular games because I really liked their subjects, with the exception of baseball. Baseball I only like pretty much, but I reckoned there are a bunch of people who like baseball and might enjoy playing it electronically. I chose the building-blocks game because the guy who sold me the other games actually got flushed when he talked about it. "Awesome,"

FUN!

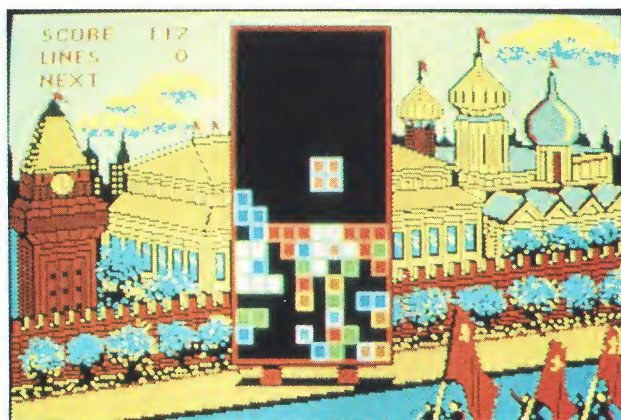


Better Dead than Red?

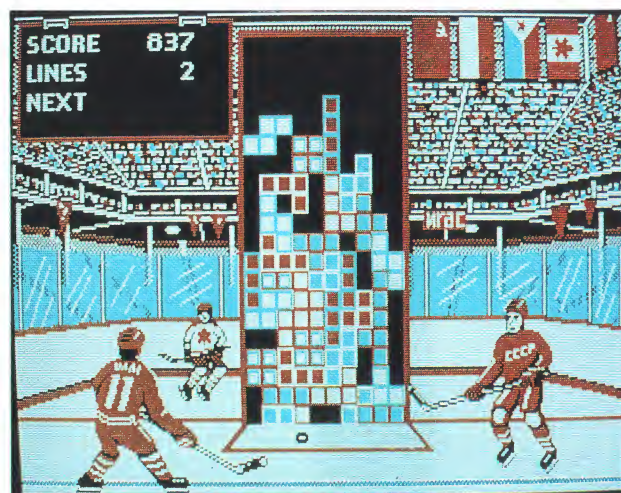
Tetris could be a disease. Or an insecticide. It isn't. It's *The Soviet Challenge*, brought to us by Spectrum HoloByte. Sounds exciting, nyet? Is it Russkies massing on the East German border with NATO set to repel? Red Storm Rising on your CRT? No. It's much better than that. The "challenge" is to make solid layers out of little geometric forms that fall from the top of your screen. The more solid layers you create, the higher the score. But here's the really good part: you use the keypad or a joystick to move or rotate the forms as they descend so they fit together, leaving no empty spaces. You can vary the descent speed and the height of the "floor" to change the degree of difficulty. With such excitement, who needs tanks?

Why "Soviet Challenge"? The game was invented by a researcher at the Computer Centre (Academy Soft) of the Academy of Scientists in Moscow and programmed by a student at Moscow University. A plot, no doubt, to keep our computer guys occupied so our research falters, our defenses crumble, and then you-know-what.

The game is easy to get running, simple to operate, challenging, and stupid.



Is it Russkies massing on the East German border with NATO set to repel? Red Storm Rising on your CRT? No, it's Tetris: The Soviet Challenge. The challenge is to make solid layers out of little geometric forms that fall from the top of your screen. The more solid layers, the higher your score.



Tetris: The Soviet Challenge

List Price: \$34.95
Requires: 256K RAM; CGA, EGA, or Hercules graphics card.
Instructions: 5 nerds
Ease of Operation: 5 nerds
Fun to Play: 5 nerds

Spectrum HoloByte
 2061 Challenger Dr.
 Alameda, CA 94501
 (415) 522-0107



Fastball

Baseball is 150 years old, and after the first 5 minutes with the instructions, I was convinced it would take me at least that long to figure out Electronic Arts' *Earl Weaver Baseball*. Here's just a sample of what the program can do:

Throw forkballs, screwballs, and brushbacks. Pull, bunt, or hit to the opposite field. Pick off runners. Steal. Field and throw to a specific base. Create customized lineups of players. Start a pitcher warming up in the bullpen to replace a

pitcher who's getting tired. Trade players. Shift the defense. Keep stats.

The only things missing from this game are scratching, spitting, and a simple one-two-three tutorial: how to pitch, how to hit, how to throw. These basics could be followed by the more complicated details.

I found the reference card and the instruction manual so impenetrable on first reading that I gave up and called the company.

This is an important point to remember. You can

call the companies that make computer games, admit to any level of frustration and/or ineptitude, and some nice person will help you. Although I let the baseball people know I was reviewing for a magazine, I got the same courteous and helpful response from another outfit when I presented myself as an ordinary civilian.

After talking to the company and spending a few hours with the manual, I realized that everything you need to know is, in fact, there. The challenge is to find it. The frustration potential here is very high.

When the rigmarole of selecting the lineups is completed—I won't get into the many possibilities—and play is underway, you get a split

controls the batter. And vice versa when you're up.

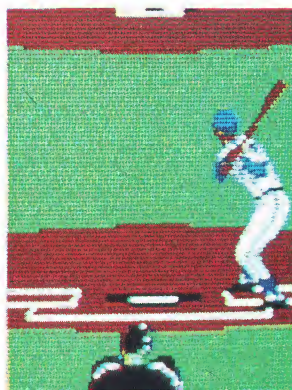
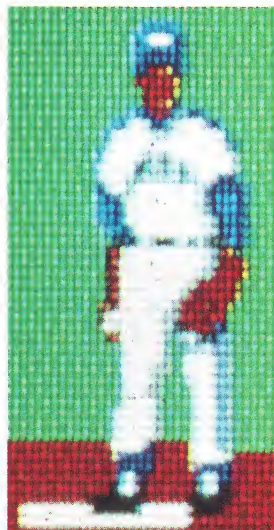
The players on the field are necessarily small and the action is sometimes difficult to follow. The graphic depiction of the pitcher and batter is superb, however, and their actions are smooth.

Although this game can be enjoyed at a surface level, it's really for serious baseball fans who want to get deeply involved in game strategy and the strengths and weaknesses of the individual players.



The only things missing from Earl Weaver Baseball are scratching, spitting, and a tutorial on how to pitch, hit, and throw. It's a game for serious baseball fans.

screen: two-thirds of the screen shows the diamond with the defense in place, and the remaining third shows the pitcher and the batter. In a typical game, you control the home team and "Earl" (the computer) manages the visitors. When you're on defense, you control the pitcher while Earl



Earl Weaver Baseball

List Price: \$39.95

Requires: 256K RAM, WKGE or EGA graphics, DOS 2.1 or later.

Instructions: 5 nerds

Ease of Operation: 3 nerds

Fun to Play: 3 nerds

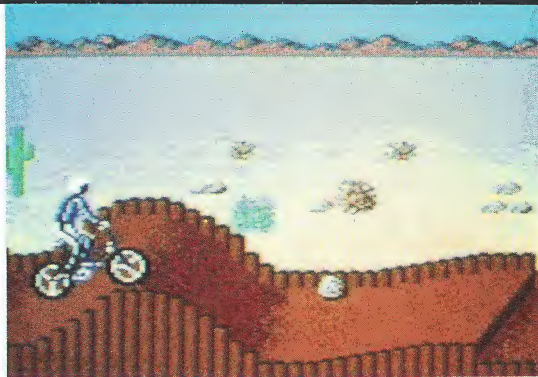
Electronic Arts
1820 Gateway Dr.
San Mateo, CA 94404
(415) 571-7171

FUN!

Arcade Maniacs

If you've spent any time at the local arcade testing your hand-eye coordination, you may like *California Games* from Epyx. This easy-to-understand and easy-to-play game is really six arcade-style games: Skateboarding, Foot Bag (Hacky Sack), Surfing, Roller Skating, BMX Bike Racing, and Flying Disk (Frisbee). One to eight people can play one or all of the activities. The program keeps track of each player's score per event and overall.

The graphics are good and the contests simple. However, because the game takes place in a "half pipe," I never got the hang of Skateboarding and can't talk about kick turns, hand plants, or aerial turns. Although you can control the action with the keyboard or keypad—depending on your computer—*California*



Skateboarding in *California Games* takes place in a "half pipe." You can experience the thrill of kick turns, hand plants, and aerial turns without having to keep an orthopedist on retainer. Hand-eye coordination is all you need.

Games really works best with a joystick. (But see the game instructions. And good luck!)

The Foot Bag game is plenty dumb, the Surfing game a little better. Roller Skating and BMX Bike Racing are completely unsophisticated. Flying Disk is my personal favorite. You have this guy fling a Frisbee, and this babe way out in the field catches it (or should, if you want to score points). The most fun can be had by waiting until the last minute so she has to make a diving catch.

California Games

List Price: \$39.95

Requires: 512K RAM, CGA or EGA graphics.

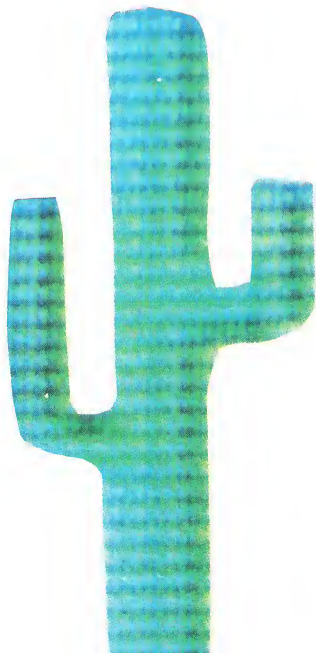
Instructions: 1 nerd

Ease of

Operation: 1 nerd

Fun to Play: 4 nerds

Epyx
600 Galveston Dr.
Redwood City, CA 94063
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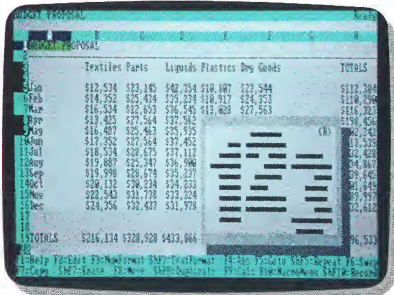
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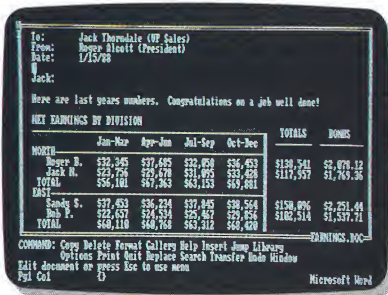
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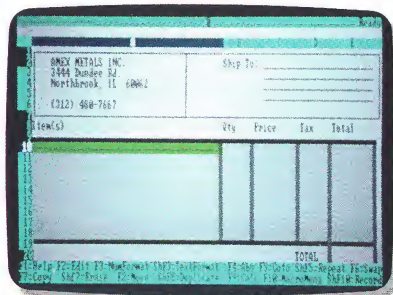
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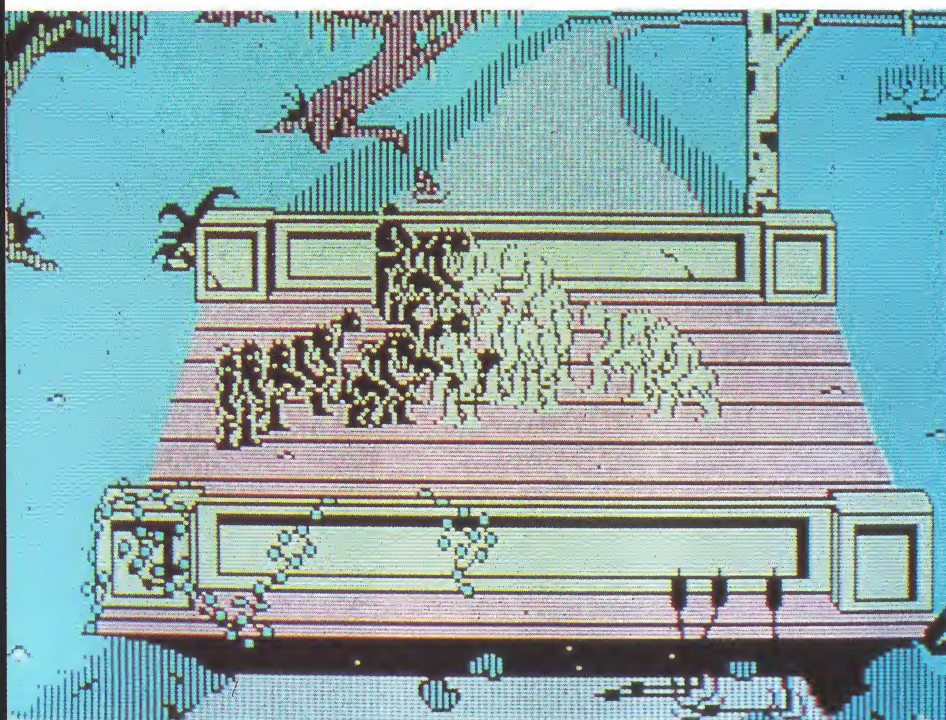
The companion spreadsheet that puts numbers where you need them

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FUN!

Crazy Ivan went crazy when you surrendered		
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CAPTURED	1	5
CASUALTIES	3	32
FLAGS TAKEN	0	1



Soldiers, knights, barbarians, enemy flags, fights to the death—it's *The Ancient Art of War*. If you're ready to claim your place in the annals of military history, you can change the makeup of the squads of soldiers, create battlefields, and write campaigns.

Old Soldiers

What's it like to go to war with the man who wrote the book?"

"What's it like to meet Napoleon at your own Waterloo?"

"Are you smart enough, quick enough, and innovative enough to claim your place in the annals of military legend?"

Those questions and more, which appear on the package containing *The Ancient Art of War* from Broderbund Software, made the game irresistible.

For me, the answers were: intimidating, frustrating, and no.

I was really cranked to play this game. Soldiers, knights, barbarians, enemy flags, fights to the death. Let me at it. But first, read the reference card. Then read the instruction manual.

Then call the company.

Actually, I called the company because I couldn't make the most important command of all—Move—work. It turned out that the cursor had to be positioned very carefully on the squad of soldiers before they could be moved. Simple. But if one doesn't figure it out for oneself, one is very stuck.

I also took the opportunity to chat up the lad on the other end. He helpfully explained some points I hadn't understood, such as how to make the rivers deeper and swifter, the mountains higher, and so forth. All of that, and much more, is in the instruction manual, which, although well written, is confusing in places.

The game is easy to play

but also complex and sophisticated. Like *Earl Weaver Baseball*, it lets you have simple kill-the-baddies fun with surface-level battles or dig deeper to change the makeup of the squads of soliders, create battlefields, and write campaigns. You can learn the condition of the enemy and its strengths and weaknesses. You can even teach your squads new tactics.

There are no sweeping Technicolor panoramas filled with realistic-looking soldiers locked in mortal combat à la Spartacus. The graphics are simple and mostly two-dimensional. Tiny little archers shoot tiny little arrows; tiny little barbarians hack at tiny little knights. And when an engagement is over, tiny little bodies are lying all over the place.

The Ancient Art of War

List Price: \$44.95

Requires: 128K RAM.

Instructions: 3 nerds

Ease of Operation: 2 nerds

Fun to Play: 2 nerds

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PC computing

FUN!

Pigskin Preview

How much fun is *NFL Challenge*? Lots. More fun than *Earl Weaver Baseball* and *The Ancient Art of War* put together.

How much does *NFL Challenge* cost? Lots. More than *Earl* and *The Ancient Art of War* put together.

But never mind. This

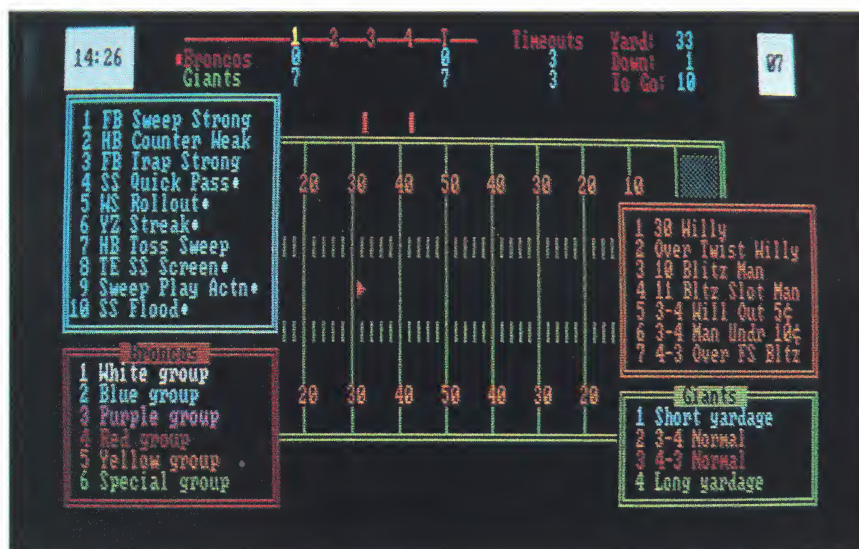
game is great. To quote from my notes, taken during an epic struggle between the Jets and the Cardinals, in which the Jets threw interceptions whenever they weren't being stopped on the 10 and the Cardinals actually penetrated the Jets' 20-yard line (is this game

realistic or what?): "Easy to figure out and operate. Sophisticated enough to keep your interest, but not so complicated as to intimidate."

The instruction manual is well written and easy to understand. Within five minutes, I had the Jets and the Cards banging heads.

First you pick the NFL teams you want to play in the game. If playing by yourself, you coach one and the computer coaches the other. If there are two players, both coach.

The basic screen shows the entire field with the ball position marked. You select plays from an extensive menu with the help of offensive and defensive playbooks. When the play is selected, the screen changes to show the teams on the line of scrimmage—O for offense, X for defense. When the ball snapped, both teams follow the prescribed play, which is then repeated in slow motion.



Die-hard football fans may want to intercept *The NFL Challenge*. The basic screen shows the entire field with the ball's position marked. When you select a play from the menu, the screen shows the teams on the line of scrimmage. The ball is snapped, the play begins. You even get a replay of the action in "slo mo."

NFL Challenge

List Price: \$99.95

Requires: 256K RAM with DOS 2.0 or 2.1,
320K with DOS 3.0 or later or
MS-DOS.

Instructions: 1 nerd

Ease of Operation: 1 nerd

Fun to Play: 1 nerd

XOR Corp.
5421 Opportunity Ct.
Minnetonka, MN 55343
(612) 938-0005

However, the program generates its own variations, so you may call a pass play only to see your quarterback choose to run (yes, you can yank him from the game). Passes are frequently dropped, sometimes intercepted. Penalties are called and players are injured.

You can substitute players with special skills and send in special teams. After the two-minute warning, the offense automatically runs for the sidelines and the quarterback takes more chances with his passes. ■

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- **QMODEM V1.1 (293 & 294)** - (2 disk set) Full featured modem program. 200 number dialing directory, etc.
- **PROCOMM V2.42 (53 & 54)** - (2 disk set) Menu driven modem program, excellent documentation; still one of the best.
- **BOYAN VDS - (467)** - Modem program that has received great reviews by all.

DATABASE

- **FILE EXPRESS V4.14 (33 & 34)** - (2 disk set) Menu driven, easy to use database for beginners to experienced.
- **WAMPUM V3.1B (37 & 38)** - (2 disk set) Menu driven dBase III clone, supports functions of dBase. Knowledge of dBase suggested. Latest update.

- **PC-FILE + V2.0 (493 - 495)** - (3 disk set) Full-featured database; help screens, menus, macros. One of the best.
- **DBASE III UTILITIES (349)** - Contains utilities for household inventory, C language & Desktop, etc. dBase III req.
- **dGENERATE V1.0 (511)** - Screen & source code generator by Tom Rettig. dBase III required.

EDUCATION

- **COMPOSER (3)** - Create, save, edit, play, & print your music. Nice...
- **LETTERFALL V1.1 (119)** - Improve your touch typing skills; 16 levels.
- **BEGINNING SPANISH (121)** - Teaches vocabulary, phrases, etc. Basic required.
- **THE WORLD 3D (127)** - Display maps of the world. CGA required.
- **FUNNELS & BUCKETS V 2.0 (130)** - Great learning game; add, subtract, multiply, & divide. Ages 5 - 10.
- **ERYN'S ABC'S (131)** - Teaches alphabet & numbers. Computerized Etch-a-Sketch. Ages 2 - 6. Basic required.
- **MATH-WHIZ (188)** - Teaches various math operations. Ages 5 and up. You choose the level. Basic required.
- **AMY'S FIRST PRIMER (133)** - Alphabet, numbers, counting, shapes, matching, etc. Ages 4 - 8. CGA & Basic req.
- **SAN MATEO EDUCATION (136)** - Teaches math, chemistry & geography. Ages 8 - 16. CGA required.
- **SPELLING BEE (138)** - Grades 1 - 12. CGA & Basic required.
- **POLYGLOT V6.01 (139)** - Vocabulary builder. Grades 7 - college. Excellent.
- **ANIMAL MATH/MOSAIC (181)** - Count objects & graphic learning tool. Ages 4 & up. CGA required.

EGA PROGRAMS

- **EGA RISK (218)** - The game of world domination. Superb graphics.
- **EGA UTILITIES/1 (260)** - EGA demos, change fonts & size of letters, etc.

GAMES

- **SLEUTH V4.1 (89)** - Murder mystery game similar to the board game "CLUE".
- **BLACKJACK (95)** - Advanced blackjack game with tutor, multiple players. Best one yet. CGA or Hercules.
- **MONOPOLY V6.7 (106)** - Just like the board game. 2 to 4 players. CGA req.
- **DUNGEONS & DRAGONS V1.1 (205)** - The Classic Game. Can you survive?
- **LAS VEGAS (116)** - Craps, Roulette, Poker, & more. CGA req. Basic on some.
- **3D CHESS V1.01 (215)** - Excellent chess game. Switch between 2D & 3D.
- **SAM SPADE V1.0A (228)** - Great detective game. Maze game; creates mazes.
- **SOLITAIRE (211)** - 4 different games. Nice graphics. CGA required.
- **SUPER PINBALL (212)** - 5 different games. CGA required.
- **WORDPLAY (367)** - Wheel of Fortune clone. You provide the prizes. CGA req.
- **HANGMAN (91)** - 2 versions of the ever popular game & learning tool.
- **DIGITAL LEAGUE BASEBALL (344)** - Pick your team & players. Nice graphics.
- **MINIATURE GOLF (505)** - 18 hole golf course with graphics.
- **BRAIN TEASERS Vol 1.00 (500)** - Teasers in over 25 different categories.

GRAPHICS

- **FINGERPAINT V2.0 (282)** - Paint program; 6 fonts, 81 sizes. Use for desktop publishing, slide-show & cartoon playing. CGA, EGA, or Hercules. Excellent...
- **LIGHTING PRESS (266)** - Printmaster Plus clone, flyers, greeting cards, etc.
- **FLOWCHARTER V1.93 (482)** - Produces flowcharts using simple commands, translates into actual symbols.

- **CITY DESK V6.0 (197)** - Desktop publisher with graphics capability.
- **PRINTMASTER GRAPHICS (319)** - 3 libraries of graphics for Printmaster Plus. Requires Printmaster Plus.
- **PRINTSHOP GRAPHICS (320)** - 3 more libraries of graphics for Printshop. Requires Printshop.
- **PC-KEY-DRAW V3.33 (534-536)** - (3 disk set) - Combination CAD & paint program for power & flexibility. Does drawing, paint, multiple fonts, animation, etc.
- **DANCAD 3D V2.0B (424 & 425)** - (2 disk set) Advanced 2D/3D drafting program. Stereoscopic 3D wire frame animation. EGA, CGA, Hercules. 640k req.
- **EGA TROPICAL FISH (427)** - An aquarium on your computer screen. EGA required. Also contains CGA fish program.

LANGUAGE

- **TURBO "C" TUTOR (489 & 490)** - (2 disk set) 14 lesson tutorial; learn to program in "C" language.
- **"C" LANGUAGE V2.1 (299 & 300)** - (2 disk set) Complete programming environment. Source, compiler, samples.
- **WINDOW BOSS (322)** - State-of-the-art screen handling techniques for "C" language. Pop-up windows, menus, etc.
- **TURBO PASCAL TUTOR (20)** - 17 lesson tutorial with samples, etc.

MISCELLANEOUS

- **STRESS & SHRINK (74)** - Stress - stress test. Shrink - personality analysis.
- **HORSERACING (343)** - Handicapping for thoroughbreds.
- **FAMILY TIES V1.15 (154)** - A genealogy program for the amateur or pro.
- **ASTROLOGY V9.5 (284)** - Read your own chart from stars, moon, etc.
- **FASTBUCKS (191)** - Menu-driven home finance package. Easy to use.
- **BIORHYTHM (194)** - Calculate & print your own monthly charts.
- **MINI-COUPCAT (410)** - Coupon mgmt. system for cataloging & organizing.
- **MEALMATE (332)** - Nutritional database for meal planning.
- **HEALTH RISK (331)** - Diagnose your own ailments.
- **AIRPLANES (398)** - Print paper airplanes, fold-em and let 'em fly. Basic req.
- **RECIPES V1.0 (445)** - Over 125 recipes, adjust serving sizes from 1-99.
- **LITTLE BLACK BOOK (441)** - Creates pocket sized address book. Prints mini-alphabetized pages.
- **TIMESAVER (442)** - Create daily/monthly calendar of appointments.

PRINTER UTILITIES

- **LQ V2.1 (509)** - Produces high quality text on dot matrix printers. Multiple fonts with print spooler.
- **LASERJET FONTS/I (327)** - 30 + downloadable fonts for Laserjet Plus/II.
- **LASERJET FONTS / II (471 & 472)** - (2 disk set) More downloadable fonts for HP Laserjet Plus/II, Helvetica, Script, etc.
- **LASERJET FONTS/UTILITIES (328)** - Contains "Pamphlet" (sideways printing) & misc. other utilities & fonts.
- **PRINTPRO V1.2 (468)** - Change printer operation from within ANY application at ANY time.

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- **PC CALC + V 1.0 (537-539)** - (3 disk set) - Complete Spreadsheet program. Excellent...Buttonware.
- **LOTUS LEARNING SYSTEM (458)** - Beginning tutor for Lotus 123.
- **LOTUS 123 PROGRAMS (28 - 32)** - (5 disk set) Contains applications and utilities. Requires Lotus 123 program.
- **LOTUS DESKTOP (507 & 508)** - Menu-driven. Uses macro capabilities of Lotus.

- Memos, phone, etc. Req. Lotus.
- **LOTUS 123 TUTOR (177)** - Beginning tutorial for Lotus 123. Various worksheets. Requires Lotus 123.
- **AS EASY AS V3.0 (302)** - Lotus clone. 52 column sheet, graphing, supports functions of 123, "WKS" files, etc.

UTILITIES

- **DISK COMMANDO V2.0 (218 & 219)** - (2 disk set) Norton Advanced Utilities clone. Too many features to list.
- **SIM-CGA (220)** - Great for most programs that need color (CGA) to run. For Hercules monochrome monitors.
- **DOS HELP (255)** - Help screen for DOS commands, functions & batch files at your fingertips. For DOS 3.XX.
- **DOS TUTORIAL V4.2 (256)** - Menu driven, learn to use your computer.
- **BEGINNERS (257)** - The basics of using most public domain software.
- **LIST V6.2A (274)** - Best utility for viewing documentation or any ASCII file.
- **DESKMATES V1.01 (278)** - Sidekick like utility plus more features.
- **AUTOMENU V4.01 (280)** - Access programs, batch files, commands, etc.
- **STILL RIVER SHELL V2.36 (369)** - Excellent directory & file mgmt. utility.
- **FLASHBAK V1.56 (217)** - Menu driven hard drive backup system.
- **BATCH TUTOR (223)** - Make your computing easier & foolproof.

WORD PROCESSING

- **SEWITER (6)** - "Sideways" printing; great for spreadsheets.
- **RELIANCE MAILING LIST V2.0 (161)** - Easy to use, menu-driven, labels, mail-merge, etc. 32,000 names maximum.
- **PC-WRITE V2.71 (9 & 10)** - (2 disk set) Full featured word processor; all the features of the expensive one's.
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DOS

UNRAVELING THE MYSTERIES • By VAN WOLVERTON

Even advanced PC users can be puzzled by DOS. The operating system may seem like a mysterious collage of technical arcana, responding only to a few cryptic commands—which you *must* type perfectly—and revealing only the identity of the drive it's logged into, saying simply C:>.

At its heart, however, DOS is a simple program that links the user and the computer. It contains a number of tools that can make your system more powerful and easier to use. In this column, the first of a series, we will explore one of DOS's chief tools—a file called AUTOEXEC.BAT.

AUTOEXEC.BAT is an ordinary text file. This file contains a collection of commands, and DOS automatically executes these commands when you boot up your system. Any program or command you regularly run when you start your system is a candidate for inclusion in your personal AUTOEXEC.BAT file.

The types of programs and commands you may want to include in your AUTOEXEC.BAT are the following:

- Memory-resident programs like *SideKick* or *ProKey*.
- A disk cache program like *Lightning*.
- A data compression program like *SQZ!Plus*.
- The FASTOPEN command that speeds disk operations.
- Disk manager or shell programs like *Idir* or *Direc-Tree*.

By filing these programs in AUTOEXEC.BAT, you don't have to hassle with entering the commands each time you start or restart your computer. In addition, through the batch file, you can change the DOS prompt to something more informative. You can also

use the batch file to tell DOS in which directory you want to keep your programs.

A typical AUTOEXEC.BAT file might contain these commands:

```
PROMPT $P$G
PATH C:\PROGRAMS
FASTOPEN
SK
CD \WORK
LOTUS
```

The instructions in this file tell DOS to make the system program display the current disk and pathname as the prompt (the \$P indicates the current path; the \$G, the prompt or greater-than sign). The file's instructions also ask DOS to load programs from a subdirectory called PROGRAMS on drive C:—no matter which drive or subdirectory you're currently logged into. In addition, they tell DOS to run the FASTOPEN command; to load *SideKick*; to change the currently logged directory to WORK; and finally, to enter the *Lotus 1-2-3* program.

One problem you might encounter with computers built with pre-AT technology is that AUTOEXEC.BAT automatically prevents DOS from asking you to enter the time and date. (AT and PS/2 computers know the time and date from their internal clocks.) However, you can make AUTOEXEC.BAT query you by adding the commands DATE and TIME to the file.

Starting Out Easy

You can create or change AUTOEXEC.BAT by using a text editor (like EDLIN, which is included on one of your DOS distribution disks). You can also use a word processor that lets you

save text “files” without using formatting codes. *Microsoft Word* calls this *not formatted*, while *WordStar* calls it *non-document* mode.

You don't have to have an editor, or a special word processor, however. The simplest way available to create an AUTOEXEC.BAT file is to use the COPY command to enter text directly from the keyboard to the batch file.

To begin experimenting with AUTOEXEC.BAT, build a file that can serve as a framework for later exploration. Copy the system disk to a new floppy disk and type the following instructions at the DOS prompt:

```
COPY CON A:AUTOEXEC.BAT
PROMPT Hello from PC/Computing
DATE
TIME
^I
```

You have just told DOS that you wish to COPY the file called Con (which is your keyboard) to a file called

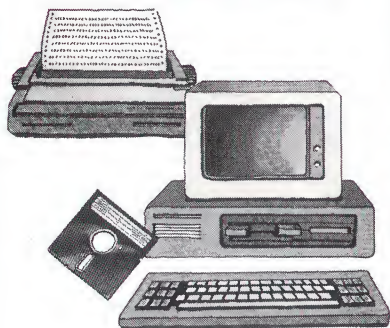
It may take a few tries to get the right commands for your AUTOEXEC.BAT, but the satisfaction of being in control of your system is worth it.

AUTOEXEC.BAT; to make the prompt read, “Hello from PC/Computing”; and to list the date and time.

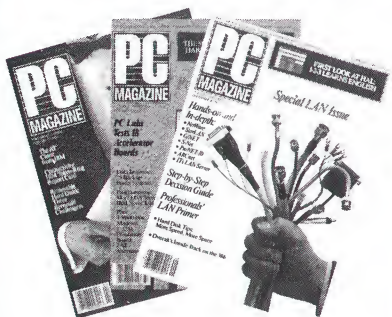
Finally, with Ctrl-Z, you told DOS to clear the screen.

FOR RETAILERS
ONLY:

**BECAUSE
YOU SELL
ONE OF
THESE...**



**YOU SHOULD
SELL THIS...**

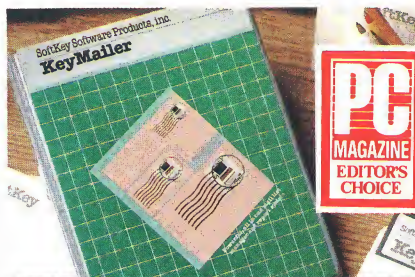


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DOS

To test these commands, boot your system with the new floppy disk, and see if it acts as usual but gives the new prompt: Hello from PC/Computing. You can check the contents of the file by typing "type autoexec.bat". DOS should display the four commands you typed a moment ago.

Using the COPY command and your favorite word processor, you can add other commands and program names to make DOS do your bidding automatically—every time you boot your system. Just type "copy autoexec.bat +con". The plus sign tells DOS to combine the two files into one. DOS displays the names of the two files it's going to combine (AUTOEXEC.BAT and Con), then waits for you to type the contents of Con. Type the command you want to add, then press Ctrl-Z to clear the screen and to end the COPY command.

If you've written a program in GW-BASIC that you'd like it to execute, simply include the name of the program with any series of DOS commands that you've selected. And remember that unless you add time and date prompts to your AUTOEXEC.BAT file, DOS will automatically bypass these.

It may take you a few tries to get the right mix of commands for your AUTOEXEC.BAT file, but the satisfaction of being in control of (rather than con-

**The underlying
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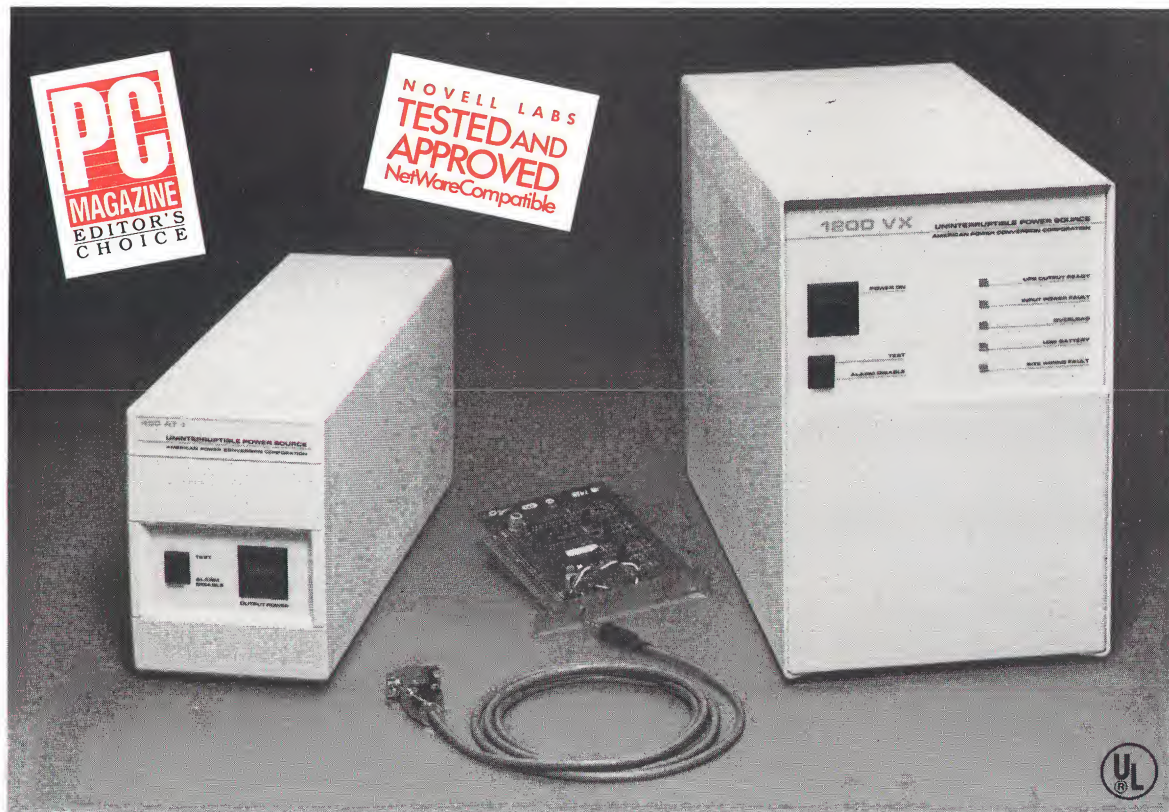
trolled by) your system is worth it.

In future issues, this column will discuss, with other aspects of your operating system, everything from the Power On Self Test to the three special programs that get the juices flowing through your machine. (PC-DOS calls these programs IBMBIO.COM, IBMSYS.COM, and COMMAND.COM, but the names vary in MS-DOS.) ■

LAN's Best Friend

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Beautifully Simple

Simply Beautiful

Consider this: How many Pixie menu selections does it take to create a complete bar chart – with annotation, axes, title, and legend? Just *one*.

How many menu selections are needed to change the bar values? Add to the title? Change the axis scaling? Add more bars? Would you believe... *none*.

Zenographics introduces Pixie, a new charting and drawing program with the simplest, most obvious user interface yet devised for presentation graphics.

In technical terms, it's called *direct manipulation*. To you, it means *instant learning* – and because it's so visual, Pixie is one program you'll never forget how to use.

Based on Microsoft® Windows, we think Pixie is the best example yet, in any software category, of the power of the graphical user interface.

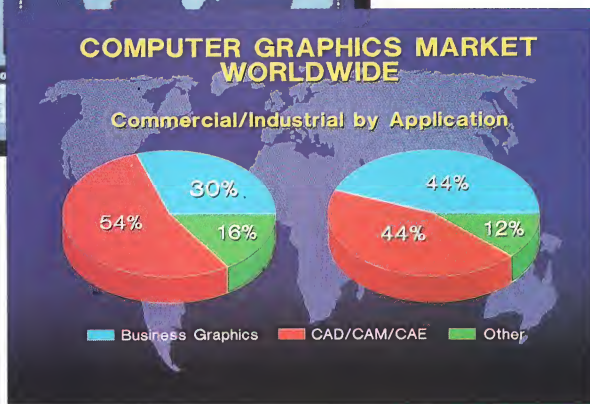
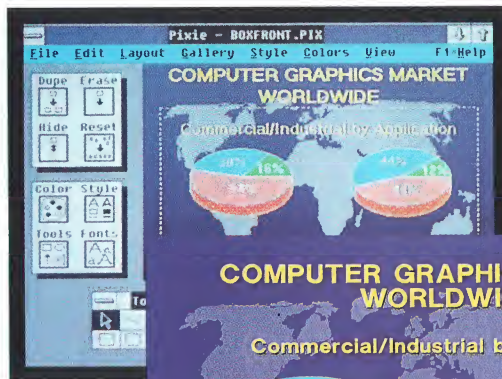
Deep down, you know why you invest in graphics: you want to look good. You want to impress, to entertain, to inform, to *sell*.

Pixie can make you look good. Just because it's simple doesn't mean it isn't beautiful – great color, shaded backgrounds, clean typefaces, drop shadows, 3-D effects, and more.

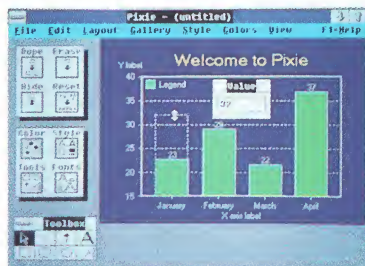
Take a look at the slide on the left. Does it look like it could be created by a graphics amateur? In 10 minutes? With a \$195 graphics package? Thousands of Pixie users are making this very image: it's Lesson 3 (just six pages) in the Pixie manual!

Pixie is Zenographics' newest winner. It connects

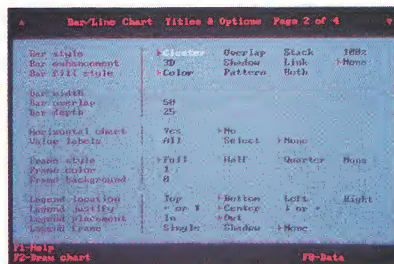
beautifully with our flagship product **Mirage** – the PC-based tool of choice for graphics professionals. Through Mirage, Pixie gains access to the best and most complete output device drivers, and to the artistic expertise of thousands of Mirage power-users worldwide.



	Pixie	Harvard Graphics	Freelance Plus
Graphical user interface?	Yes (MS Windows)	No	No
User interface technique	Direct manipulation	Fill-in forms	Fill-in forms
Editing preserved if chart changes?	Yes	No	No
Screen Fonts	Windows, Bitstream, Mirage	Helv, 1 hardware font	Stick
Maximum colors per image	16 million (Windows limit)	16	12
Compatible with professional systems?	Yes (Mirage)	No	No
Price	\$195	\$495	\$495



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MEDIA

ARTS AND LETTERS • By ANNE STUDABAKER

The CD-ROMs are coming—at last—and one of the first information products available in the compact disk read-only memory format for computer search and retrieval is, naturally enough, a library of information about computers.

Introduced in May by Ziff Communications Co. and Lotus Development Corp., *Computer Library* is a clip file of articles from computer periodicals—but in the kind of volume only a CD-ROM disk can provide. The disk contains the full text of 19,000 articles from ten computer-industry journals, including *Byte*, *Digital Review*, *InfoWorld*, *PC Magazine*, and *PC Week*. In addition, it has abstracts of 43,000 articles from more than 120 other periodicals, including *The New York Times*, *The Wall Street Computer Review*, *CommunicationsWeek*, and *Online Today*.

Computer Library is a tool for research by journalists, PC coordinators, management information systems (MIS) directors, and marketing managers. The \$695 subscription price includes the first CD disk, documentation, and an updated disk every month for 12 months.

Access to such volumes of information requires power. On the hardware side, that means an IBM PC/XT, PC AT, or compatible; a CD-ROM drive (Ziff offers a Sony player for an additional \$635); DOS 3.1 or later; at least 300 kilobytes of RAM; and 500K of available space on a hard drive.

On the software side, *Computer Library* comes with the muscle it needs to effectively search more than 40,000 items.

The search software offers Browse, Query, Copy, Maintenance, Info, and Exit options. To start a search, simply type "Q" for query and hit Enter.

To research the DOS-versus-OS/2 debate, for example, you frame the query by typing "DOS and alternatives"

and hitting Enter.

The cursor disappears and a window pops up. The library has 15,873 references to "DOS" in its memory, 880 references to "alternatives," and 176 documents in which the two are linked.

The curious can escape from the query by hitting "B" and can browse through the 176 documents by pressing a cursor key—each reference to DOS and alternatives is highlighted. And if 176 items prove too many to review (it

CD-ROM products in the financial-information area, including *OneSource*. *BlueFish* includes some very powerful capabilities for searching large full-text databases, including proximity searches using "within," "without," and "andp"—an operator that looks for two search terms in the same paragraph.

Computer Library is about as compatible a product as exists in the still-incompatible world of CD-ROM. The library disks and Sony Model 6100 CD-

The Computer Library is a clip file of articles from computer periodicals but in a volume only a CD can provide.

is a lot), simply escape back to the main menu to edit the query.

The original query is retrieved by typing "Q" once again, followed by "F2". With the word "obsolete" added, the library yields only six documents that contain all three of the words we specified.

Browsing through the six articles is quick and easy; a variety of keys—arrows, PgUp, PgDn, Plus, and Minus—move the display from line to line, page to page, article to article.

Saving an article is as easy as copying a file. The F10 key brings up a menu of file-management functions: Log, Query, Setting, Mark, Goto, Attachment, Copy, and Exit. From the list of documents on the screen, one is marked and a file name and drive specified. "Copy" writes the article to a text file on magnetic disk. From there it can be worked on with a word processing program—included in a document, edited, and printed out.

The search software is the *BlueFish* product from Lotus Development Corp., which has developed its own

ROM drive are compatible with the High Sierra standard subscribed to by a number of hardware makers and CD-ROM publishers, including Microsoft, which offers *The Microsoft Bookshelf*.

Computer Library is a useful, usable research tool, but a library it is not. It lacks that particular musty, dusty smell of piles of old journals that any researcher associates with the acquisition of knowledge. And maybe the first disk should come with a sign to put on top of the user's computer: "QUIET, PLEASE." ■

Computer Library

List Price: \$695 per year.

Requires: At least 300K RAM and 500K available space on hard disk drive, CD-ROM drive, DOS 3.1 or later.

In Short: This CD-ROM package is easy to use and provides computer information from more than 130 periodicals.

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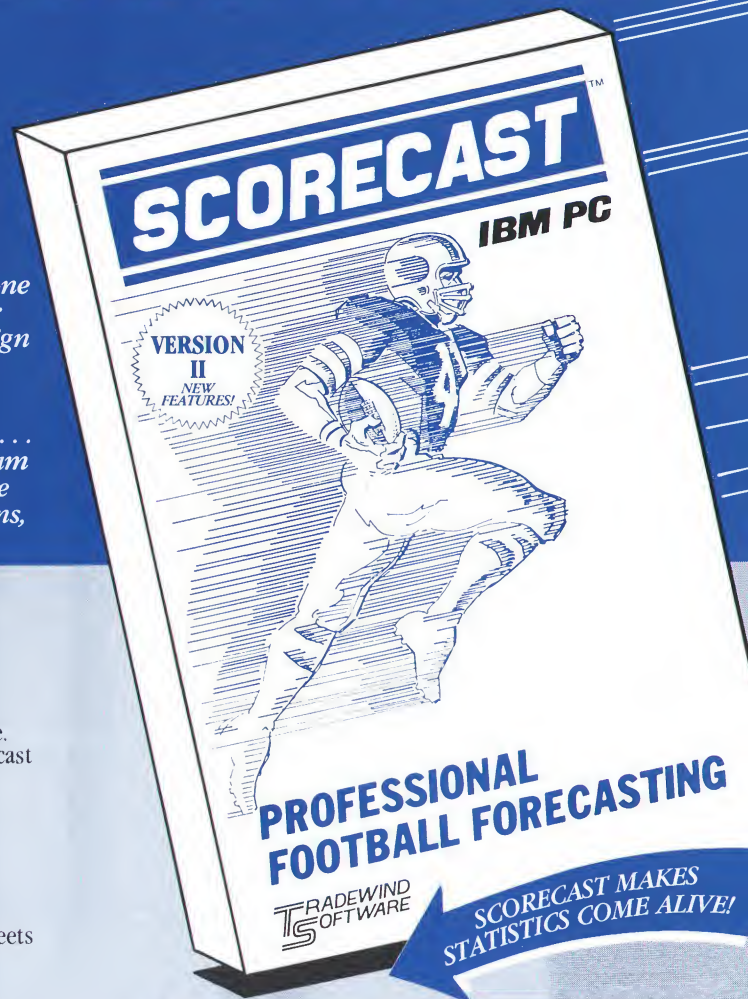
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Rushes-yds	18-53	45-157
Passing-yds	137	219
Sack-yds lost	7-44	2-20
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Fumbles-lost	6-39-0	3-48-0
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Visiting

NFC-E New York Jets	81	80
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KIDS

By, FOR, AND ABOUT . . .

May 27, 1988

Dear Dad,
This is the dumbest thing I've ever done for you! Asking you for something in a letter, but if it will get me a computer I will do it.

For starters if I had a computer then this letter could be much neater and all the punctuation and spelling would be all correct. You are probably saying "Why don't you use a dictionary," but that takes sooooo much longer. With a computer I could look up words with just a touch of a button.

If I had a computer you wouldn't have to stay late at your office to help me type my term papers on your computer, I could do my own. My grades will be much higher because all my assignments would be typed and done. Now you're probably saying "Why don't I buy you a typewriter." But a computer has so many advantages - my formatting and typing will improve from knowing nothing to knowing practically everything. Oh! and of course my drawing will improve along with my ability to play games.

Love your daughter desperately
seeking a computer - Sara

"If I had a computer this letter could be much neater and all the spelling and punctuation would be correct."



Sara Walker, 13, lives in New York City. Her experience with computers, besides her father's office PC, has been in school with classroom Apples.

Kids . . . this is your page in PC/Computing. Not just for you, but also by you. Send us your submission for this department (size limit: one 8½" x 11" page) to: KIDS Department, PC/Computing Magazine, 80 Blanchard Rd., Burlington, Mass. 01803. If we publish your letter, we'll send you a check for \$25—so make sure you include your complete home address and your telephone number.

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IMPACT

PCs IN THE PROFESSIONS • By THOMAS PAGE

Time was, an architect rolled up his sleeves, sharpened his pencils, sat down at a drafting table, and made a building.

Now, personal computers are taking the practice of architecture from the Industrial Age into the Information Age. Tactile joys—pencil on paper, sheets spread across large desks, erasers and T-squares and parallel bars—are being replaced by a softly lighted terminal and mouse. These days, when an architect makes a mistake he doesn't erase it, he deletes it.

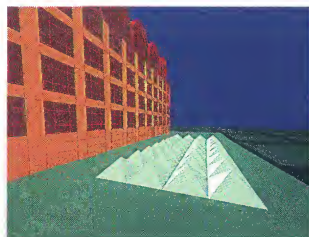
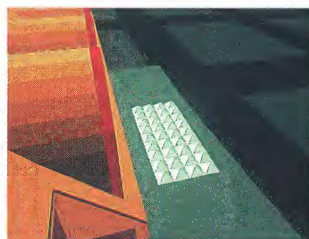
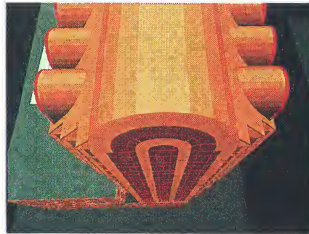
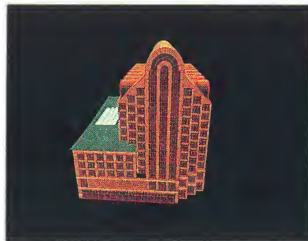
The romantic image may be fading. But if we define architecture as the ability to simulate a conception of a building in model form, then the more real the simulation, the more effective the construction process and the more faithful the building to its design. And that's where computers—from mainframes to personals—all shine.

As PCs become less expensive and their technology more sophisticated, the smaller machines are becoming the building blocks of the profession.

IBM PCs dominate the business side of architecture; the Apple Macintosh, the graphic presentation side. Acceptance of both is now widespread in applications as diverse as accounting, specifications, project management and scheduling, and, in the last year or two, marketing and all forms of report writing.

Personal computers are putting architectural competition on a more even plane. A small company that uses its PCs in the right way can be as effective

The exteriors shown here are part of an architectural proposal for the headquarters of Edison Brothers Stores. The computer animation is by David Munson of HOK Architects.



in creating proposals, designs, and drawings as a large firm with a mainframe.

Computer-assisted design (CAD) opens up new worlds of creativity in design and in testing options. It endlessly and effortlessly replicates details, protecting the geometry of intricate designs. Right now, most firms focus their CAD capability on production, churning out the paperwork needed for construction document packages. But as PC-based CAD becomes less expensive, more available, and increasingly reliable, PCs will be used more and more for design.

The rise of laser-printer service centers that can handle large documents gives additional impetus to PCs in their competition with mainframe CAD.

But the transition of architecture into the world of computers takes time and money—lots of both.

When the computer age hit, many ar-

The tactile joys of pencil on paper are being replaced by a softly lighted computer terminal and a mouse.

chitects spent enormous sums on expensive mainframe CAD equipment and training only to have their operators pirated away. As a result, many firms have simply let the fancy big machines sit idle, turning them on to impress a client but doing the majority of their work on personal computers.

But architects who grew up in an electronic environment appear to accept and use computer technology with greater willingness and ease. They

IMPACT

learned on handheld calculators, not slide rules. For them, reality is electronic. And the personal computer is their tool of choice.

Of course, there is no assurance that the personal computer will be accepted automatically in any architectural office. The boss is the key—he must want it to happen.

For sheer ingenuity in overcoming computer resistance, a prize should go to a 16-person Tennessee architecture firm whose owner told the staff he would pay the first \$800 toward a home computer and provide interest-free financing on any amount above that. The only requirement: the home computer had to be compatible with the office system. Fifteen people took him up on the offer.

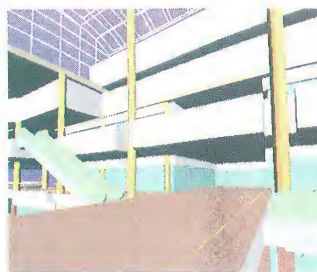
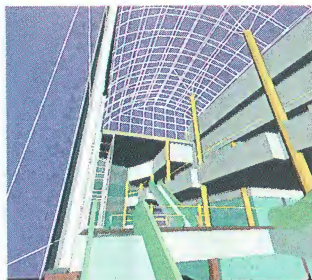
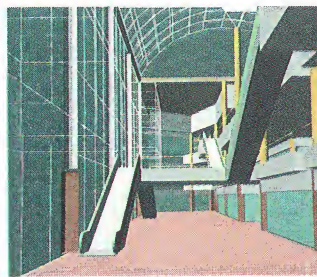
When it comes to personal computers, the average architectural firm looks for ease of use. And that's the competitive edge the Apple Macintosh offers, along with incredible graphics capabilities, desktop publishing qualities, and, equally important, its new ability to communicate with the in-house IBM.

In-house IBM compatibility is significant because the original computer experts all went for IBM and then became concerned that if any new kind of computer were introduced, a tower of electronic babel would be created. So they guarded their architectural kingdoms against invasion from non-IBM compatibles.

(In all fairness, it should be said that the smaller Apple Macintosh group was equally paranoid; its motto seemed to be, "IBM will get you if you don't watch out.")

Less than a decade ago, the main information roadways were dominated by the computer equivalent of trains, buses, and planes, all leaving on someone else's schedule and taking someone else's routes. The emergence of the personal computer and its accelerating advancement in computing power are the equivalent of the automobile: they let the individual control his own tasks. And they let him control the tasks in his own time and at his own speed.

In architecture, that might mean that a project manager uses his personal computer for a job instead of relying on the company's central mainframe and its guardians. Architecture firms, like many others, have bought personal



With these CAD-generated images of a retail project, you can "take a walk" inside the building. The images are the work of the architectural firm of RTKL Associates.

In presentations to clients or to public bodies who must approve a project, a firm can put digital stereo sound behind its slides and pictures and present drawings in three-dimensional color. And perhaps most important of all, if enough clients are sufficiently impressed, the firm can raise its fees.

Finally, CAD offers a form of electronic quality control that highlights errors, omissions, ambiguities, and conflicts in a set of drawings. By closing the window of liability a bit more, a PC can mitigate today's crushing insurance costs.

Architectural models are used in many ways: to explore design options, to present a design to a client, to sell tenant space in a building, and more. In its New York office, Skidmore, Owings & Merrill has a laser cutter that can be programmed to cut a model from CAD drawings with remarkable speed, accuracy, and fidelity to detail. It's an expensive tool right now, but as the technology accelerates, the cost will drop.

The emergence of color three-dimensional computer models, which show what a building will be like from the inside via a "walkabout" to look at the space, will change the traditions of architectural practice and presentation. Video modeling complete with words and music will make today's static models obsolete.

It seems clear that PC technology will transform a profession known for its love of tradition. Off-the-shelf software, ever-more-powerful chips, new compact disk technology—all will change the way architecture is practiced.

And it's going to happen soon. Computer-trained architects—accustomed to seeing drawings on-screen, in three dimensions and in color—are poised to take over leadership positions from those who learned to draw buildings on paper. ■

Thomas Page, director of communications for RTKL Associates, is a nationally-known figure in the field of architectural marketing.

computers complete with spelling and grammar checkers and have insisted that staffers do their own reports and interoffice correspondence. This eliminates the time involved in dictating or writing out a document and then reviewing, discussing, and revising it—often an endless task if other people have to do the retyping. As a by-product, the clerical staff—along with the overhead—shrinks.

Architecture firms want computer users, not operators or programmers. That's the virtue of the personal computer—particularly the Macintosh, which is easy to learn and incredibly versatile in the hands of visually oriented people.

In the accounting office and the drafting room, architecture firms can network their PCs for billing and for clear, accurate drawings—easy ways to impress clients.

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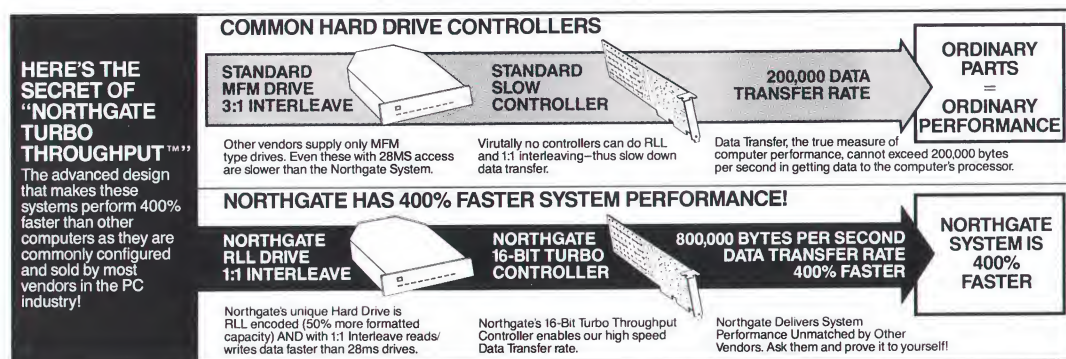
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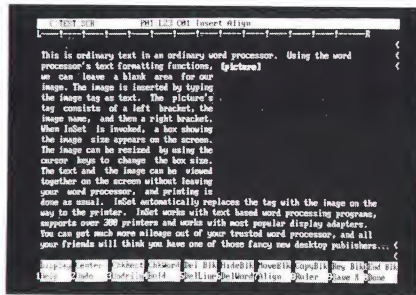
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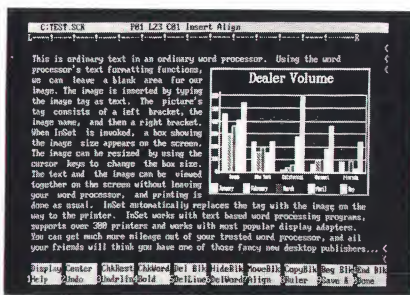
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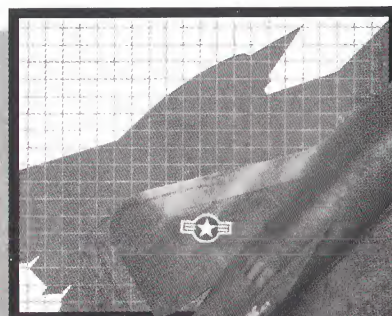
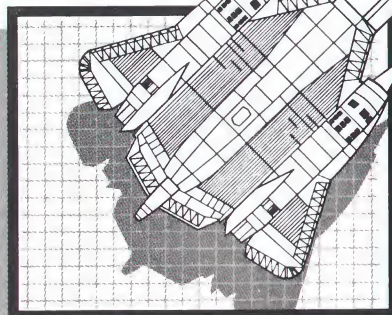
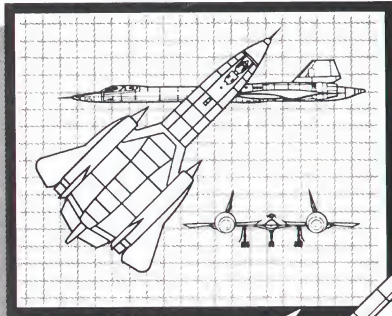
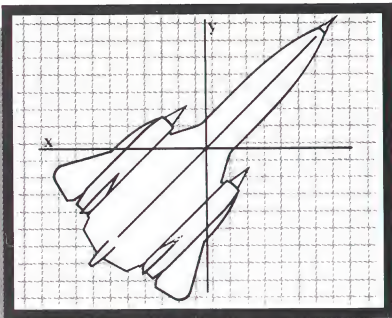
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Dynamic RAM, static RAM, interleaved RAM, page-mode RAM, and RAM caching... What are these memory schemes, and how do they affect system performance? Should I consider them when I buy my next computer?

Daniel A. Bronstein
East Lansing, Michigan

A

Here's what the memory schemes you mention are and how they affect performance:

Dynamic RAM, or *DRAM*, the most common form of memory found in PCs, has been the least-expensive type of memory available. It requires a periodic refresh to maintain its data. This extra step limits performance. When microprocessor speeds exceed the speed at which the DRAM can function, the microprocessor must wait for the DRAM, reducing or negating the value of having a fast microprocessor.

Static RAM, or *SRAM*, requires no refresh signal and is inherently the fastest type of random access memory. It is also the most expensive memory.

Page-mode RAM combines features of both DRAM and SRAM. Memory is divided into blocks, or "pages." Within a defined page, memory is accessed as SRAM, while outside the page it is accessed as DRAM.

Interleaved RAM and *RAM caching* are engineering solutions to increase performance while using slower, less expensive RAM for most of the system.

Interleaved RAM is based on the assumption that memory will be accessed sequentially. If alternate memory addresses are located in different banks

and memory is accessed sequentially, then one bank can recover while the other is being accessed. Each individual bank runs at half the system speed, but taken together they run at full speed.

RAM caching is based on the assumption that it is possible to anticipate which memory addresses will be needed. System memory is not accessed directly; instead, the contents of slower system memory are moved into a bank of SRAM and accessed from there. Being able to access faster SRAM most of the time compensates for the overhead of maintaining the cache.

When buying a computer, consider memory design only in the context of the total system. For many applications, factors such as good documentation and a comfortable keyboard will be more appreciated than a few microseconds' increase in speed.

Q

In the past year, I've used three utilities designed to optimize hard disk performance. Exactly what do these disk reorganizers do to decrease the time required to access files? Am I endangering my data in my quest for speed?

Elizabeth S. Hadley
Hoboken, New Jersey

A

Disk optimizers rearrange the location of the data on the disk in order to minimize the amount of disk activity and computer time required to find and read a file.

You are wise to be concerned when using them. Besides making frequent backups on general principle, always make backups before using a disk opti-

mizer. The one time a storm knocks out the power will be the time you are in the middle of reorganizing your disk.

Here's why disk optimizers are handy and how they work: To read a file, DOS first finds where on the disk the file is stored and then moves the drive head to those locations to read the actual data. The efficiency of both operations is affected by where the data is on the disk; it can be increased by unfragmentation (which rearranges the way each file is stored), directory ordering (which rearranges the order in which the files are stored), and directory squeezing (which removes dead entries).

Q

Does "IBM compatible" refer to (a) floppy disk format, (b) electronic compatibility, (c) DOS compatibility, or (d) a combination of any or all of the above?

Robert W. Schrader
Johns Island, South Carolina

A

You cannot know for sure. When referring to a computer, DOS compatibility means software that will run on an IBM PC will run properly. *Lotus 1-2-3* and Microsoft's *Flight Simulator* are the touchstone programs. When discussing a plug-in board, DOS compatibility means that the board will work in an IBM computer. Devices and software may be IBM compatible but not compatible with each other. Vendors attempt to maintain compatibility information, but the permutations are legion.

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HELP!

DOS should be software compatible at the DOS level, but some software circumvents DOS. Computers intended to be OS/2-compatible identify themselves as such, but it is too soon to know how true these claims are.



What are expanded and extended memory? What can they do for me?

Jeff Armstrong
Arlington, Virginia



Expanded and extended memory are two different methods of using larger amounts of memory than the PC was originally designed to access. They are of practical benefit only if used with software specifically written to take advantage of them.

Both the PC and DOS can directly address 1 megabyte of memory. When IBM designed the PC architecture, memory beyond 640 kilobytes was reserved for video. To be PC compatible, DOS must respect this boundary.

While the PC and other 8088/8086-based machines are limited to 1MB, 80286 machines (PC AT-type computers) and 80386 machines address memory beyond 1MB, using a special mode known as *extended memory addressing*.

DOS cannot use extended memory, but programs can be written that will temporarily configure the CPU for extended memory, perform some task, and then reconfigure the CPU so that DOS can again use it. VDISK, which comes with DOS, is an example of a program in which extended memory is made to behave as a very fast disk.

Expanded or paged memory is an adaptation of a scheme known as *bank switching*. Banks of memory external to the PC address space are swapped in and out of the memory area that DOS can address. (You can keep the difference between extended and expanded memory straight by remembering that the *p* in *expanded* stands for *paged*.) Expanded memory is not native to the processor; additional hardware is required to implement it.

Important points to remember are:

- Extended and expanded memory are not interchangeable.
- Extended memory is built into the 80286/80386 chips.
- Expanded memory is a hardware add-on.
- PC machines (8088/8086-based) can use only expanded memory, while AT-type (80286-based) machines and 80386-based machines can use either.
- Either type of memory is useful only when you're using software written specifically to take advantage of it.

If you are purchasing an expanded memory board, you'll want to select one that can be configured for either expanded or extended memory. OS/2, Xenix, and other operating systems use extended, not expanded, memory. The latest expanded standard is EEMS or LIM 4.0, and older boards will be identified as EMS boards.

When you buy a board for either type of memory, check on the amount of memory included. It is common for boards to come with no or little memory, and memory prices are high.



What are root directories and subdirectories? Why and how should I use them?

Sydney E. Pulver, M.D.
Philadelphia, Pennsylvania



Directories and subdirectories are a means of organizing the files on a hard disk. A typical directory structure can be seen as an inverted tree, with the root directory at the top and branches of the tree (representing subdirectories) extending downward. The root is the main directory; you can create additional directories—subdirectories—that stem from the root directory or from other subdirectories.

Besides organizing your files, using subdirectories greatly increases the number of files you can have on your hard disk. The root directory will hold only a fixed number of files; the capacity of a subdirectory is limited only by the available storage space on the disk.

A well-organized hard disk has in the root directory only the files required to

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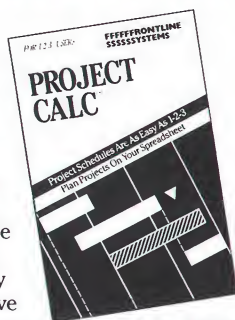
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boot the computer and a minimal number of constantly accessed files. DOS files and all application programs should be in subdirectories.

For example, you can create a subdirectory named WP for use with your word processor. The WP can contain subdirectories named DOCUMENT, LETTERS, and ARTICLES. The complete pathname to a file named PCC.HLP located in the subdirectory LETTERS would be \WP\LETTERS\PCC.HLP. Each directory name is preceded by "\", as is the filename. The first backslash indicates the root directory.

DOS commands for directory manipulation include MKDIR, to make a new directory; CHDIR, to change to a different directory; and RMDIR, to remove a directory. DEL, when used with a directory name, deletes all files in the directory. PATH= sets the default search path for executable files. These commands are covered in detail in your DOS manual.

I design information collection software. We keep work for each client on separate disks and maintain two copies in a "father/grandfather" system. When I begin a session, I load my hard disk from the "father" or most current disk. When I complete a session, I copy to the oldest disk, making it the current "father." The disk from which I loaded becomes the "grandfather." Despite my running DOS's CHKDSK and Norton's DT (DiskTest) utility, bad files have slipped by. How can I avoid this?

Win Wiencke
Chevy Chase, Maryland

Your father/grandfather approach is an excellent, disciplined system for maintaining important files.

Utilities such as CHKDSK verify the integrity of the disks, but cannot know anything about the data. You may be

verifying worthless data.

DOS provides two options for verifying file integrity. When you copy files, using the /V option or setting Verify On will force COPY to read and check each file after it has been written. Since verification takes extra time, this step is usually omitted. The DOS utility COMP.EXE compares two files. You can execute it from the keyboard or include it as part of a batch file to compare the source and destination files. You can store information about the source file with the copies to verify that they are exactly the same.

Looking at dot matrix printers, I see claims of 360 by 360 dots per inch. Can these printers actually achieve better resolution than the 300 by 300 dots per inch of laser printers?

Morgan Hing
Sacramento, California

There are two issues: the number of dots within the inch, and the size of the dots. High-resolution dot matrix printers make multiple passes across each line, placing dots in an overlapping pattern. The overlap blurs the outline of each individual dot, approximating the appearance of fully formed characters. These printers produce truly impressive output while retaining all the advantages of dot matrix technology. But that's not the same thing as printing with dots one-three-hundredth of an inch in size.

Do you have a PC-related question that might be of general interest? Our Help! Column is designed to provide concise, practical advice on the topics that interest you, our readers. We aim to cover as many subjects as possible within the available space. Please send your letters to Help! Column, PC/Computing, 80 Blanchard Rd., Burlington, MA 01803.

DON'T RUN YOUR PC WITHOUT A DOS MANAGER!

HOW TO AVOID THE CONFUSIONS IN PERSONAL COMPUTING

When the big giants designed the Personal Computer and the Disk Operating System that makes your PC do what it's suppose to do, they forgot one **IMPORTANT** thing:- To remove the thorny and messy confusion out of DOS and MS-DOS commands.

Instead the giants and their clone manufacturers did one thing; provide PC users like you with big volume of manuals that takes days to read and forever to understand and use many confusing commands in these manuals. This is the reason you are getting the headache you have with your Personal Computer or PS/2 or compatible.

What is the solution?

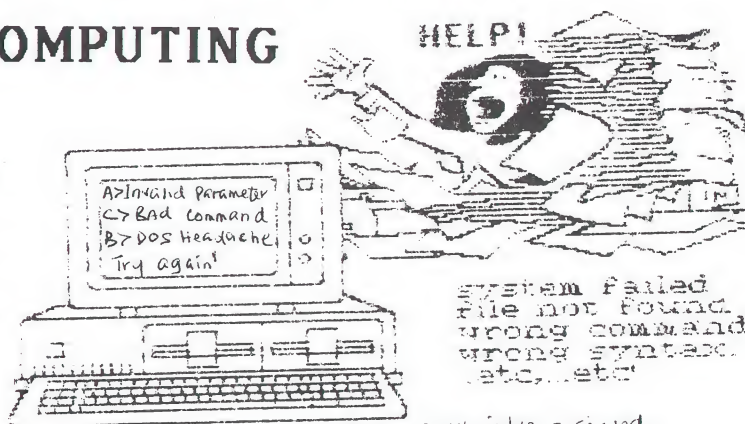
Well you don't have to go through the headaches no more. The solution is using DOS MANAGER. With all these features you sure must be serious!

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DOS MANAGER is a powerful Menu Driven utility program that enables you to operate your system by just pressing a KEY for any menu choice and your DOS or MS-DOS command will be carried out INSTANTLY.

-DOS TRAINING

Instant on screen Instructions on Basic DOS commands. DOS MANAGER's basic DOS tutorial gives examples and summarized hints on DOS commands and file management. Excellent for training students, computer novices and professionals who have no time to waste.



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-SAVE TIME

For E-Z computing with fast results and no hassles you need a software that will get the job done with a SINGLE key stroke or two.

Whether you are a professional, an expert or just a beginner you can now avoid the thorny and messy confusions of DOS and MS-DOS and the hassles that takes much of your productive time.

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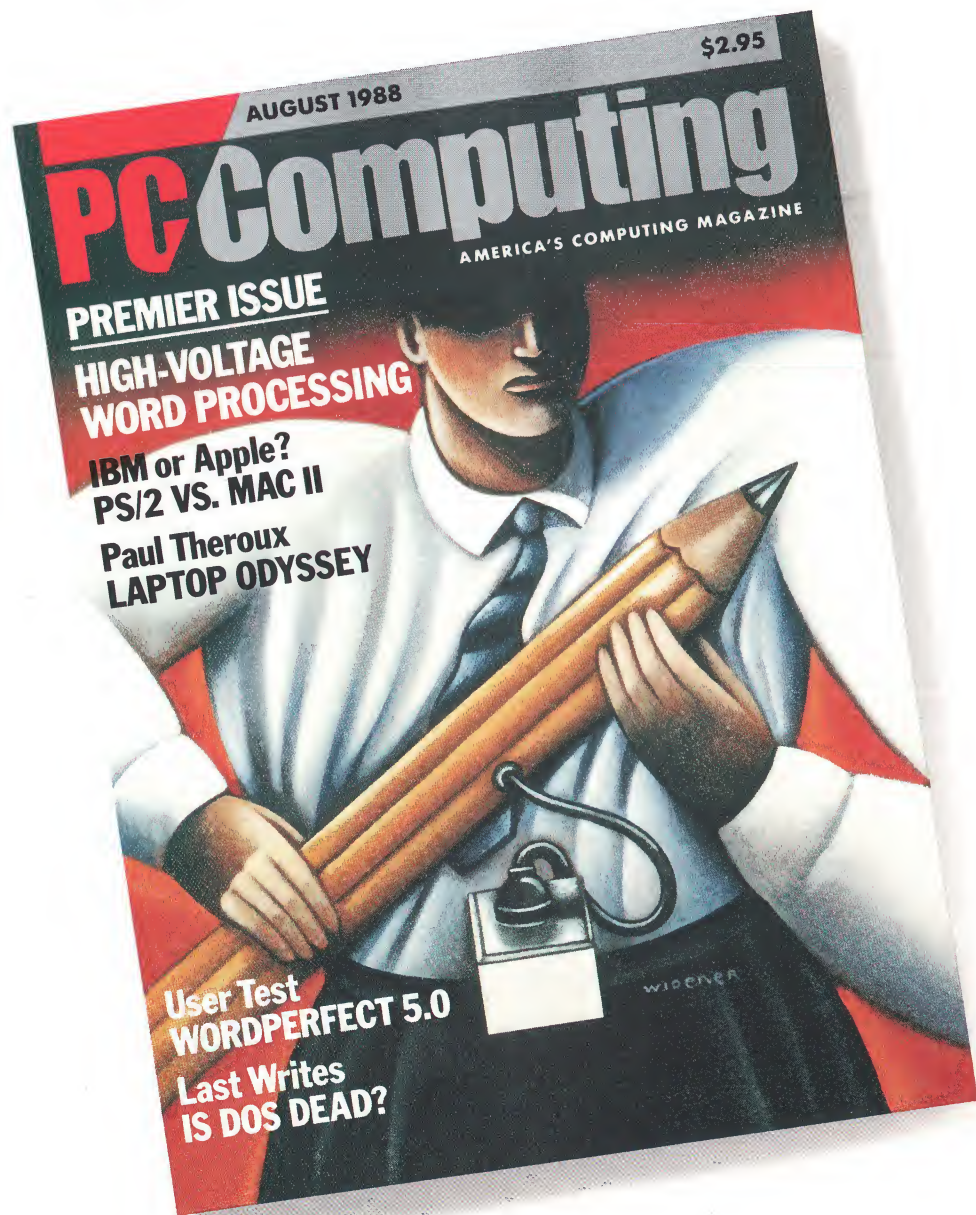
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NEXT

FUTURE THINK

By TED NELSON

From near and far you hear it proclaimed: Computers are Easy! Wonderful! Fun! Anything you want to do is possible on a computer! Heh-heh.

Buy now and just flick the switch. Simplify your life, your work. The screen will display, the disk will store, the keyboard and mouse will choreograph not just your financial accounts, writings, and plans, but all your other ideas and concerns, your creative output, your thoughts, affairs, musings, and memorandums. Swiftly (you suppose), you will write novels, symphonies, and other great works, with time in between to play lots of games and make zillions of phone calls (automatically dialed for you).

Good news: each of these things is in some way possible. But the bad news is that they won't come easily, and if you want to do even a few of them you must concentrate so much on the computers themselves, their intricacies and outricacies, that there will be precious little time for what you started out to do. You can't do it all; in fact, you can barely do the smallest part.

In a sense, the hype is all true. It's true in the same sense that the sentence "If you work hard enough, you will get rich" is true. But the word *enough* does a quick change here, from a description of what to expect to the reason you failed. Yes, it is all possible, if you do *enough*. No, it is not easy, for doing "enough" turns out to mean doing *whatever it takes*, doing nothing else.

The problem, you see, is that almost nothing fits together worth a damn. (As one who early proclaimed the time that computers would be easy, I am personally mortified to see how bad the situation is today.)

This awful tangle is impossible to describe to innocents, like beginners and laymen. It's funny about laymen: they may have grown up hating computers,

but still they imagine that computerdom is somehow orderly and sensible, somehow governed by rational principles, majestic and elegant like the orbits of the planets or the progression of Euclidean geometry.

But the chaos is virtually universal: with few exceptions, *the details of every program and machine do not mesh sensibly with the details of any other program or machine.*

Any single program can be learned and operated with relative ease. Any two can be made to fit together with some care, though the inconsistencies grate. Three or more programs (unless they are part of the same package) can, as a rule, be juggled only by a wizard who has memorized the technical equivalent of the Norse sagas. (I have a friend who sells a program for converting among 300 different file formats! This can't go on.)

So we drown in data. Small files with unknown contents multiply unseen on our disks. Unlike what's on a piece of

when it comes to setting up, creating (for the PC) batch files and paths and directories, or installing (on the Macintosh) desk accessories and fonts, the tangle becomes progressively hideous.

What should be naturally unified does not hold together. Just for text, for instance, we must learn unrelated rules for "word processing," "outline processing," "desktop publishing," "electronic mail," "bulletin boards," and "networks"—even though much of what they do is substantially similar.

Compare this to the world of books,

As one who early proclaimed that computers would be easy, I am mortified to see how bad the situation is today. The details of every program and machine do not mesh sensibly with other programs and machines.

paper that can be glanced at and discarded, the contents of a computer file cannot be easily checked, and so you keep it: an unwelcome and unidentified squatter in your office.

Oh, at the user level, such as a paint program or a word processing program, you can easily make things happen. But

which are compatible: they can fit on the same shelves, desks, tables, and laps, and can be read in the same light. We take for granted that life can't be that way in the computer world.

How bad all this is can hardly be communicated. No appropriate words exist. The horrific complications, in-

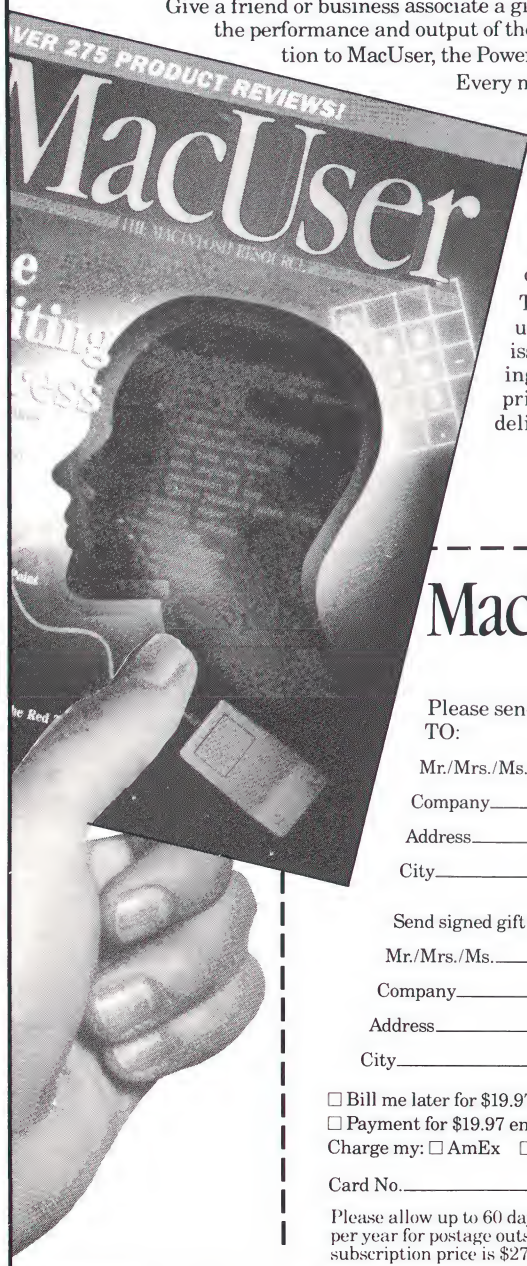


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PCC 8/88

NEXT

compatibilities, catches, and glitches can only be enumerated in dry computerese; no vocabulary has been invented to express their staggering inanity and inconvenience. And economists have not even begun to estimate the immense loss of human productivity—all squandered in these needless complications.

Beginners expect the computer world to make sense, and we who know better collude in this misconception. For in trying to welcome others in, to teach the so-called "basics," we are caught having to *pretend* it makes sense just to motivate newcomers. We teach them how to run programs, how to store data

We pretend it makes sense just to motivate newcomers.

on disks, change disks, back up files, arrange directories, and so on.

But to teach this "computer literacy" is a terrible irony, because problems of incompatibility will go away. The computer skills we teach today will not be necessary when the world of personal computing improves.

Computers should work the way beginners expect them to, and one day they will.

You will not be juggling floppies because there will be better ways to store data. You will not have to back disks up because this will be done automatically. Clumsy directory hierarchies will no longer be needed. You will be able to concentrate on the straightforward and comprehensible things you *want* to do. As you can on paper.

Let us begin thinking our way toward that time. Try to imagine the computer world as it should be. Where data can be moved smoothly from one application to another. Where the equipment and software come off the shelf sensibly configured to work together. And most important, where we can read and share data—especially text and pictures—as easily as we can read and share books, without having to learn a dozen sets of rules.

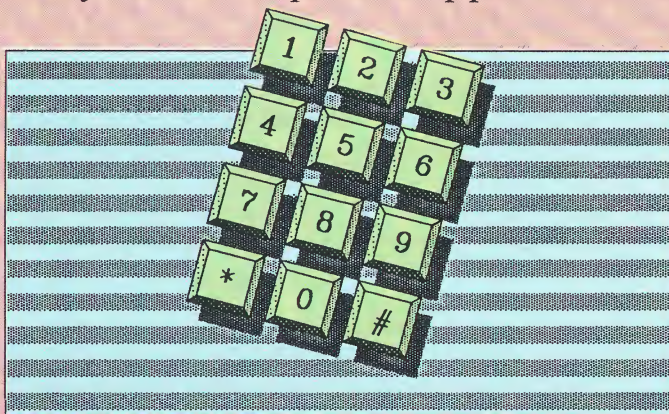
It's got to happen. ▀

Theodor Holm Nelson wrote Computer Lib, which, in 1974, predicted personal computing. He now works at Autodesk under the title of Distinguished Fellow.

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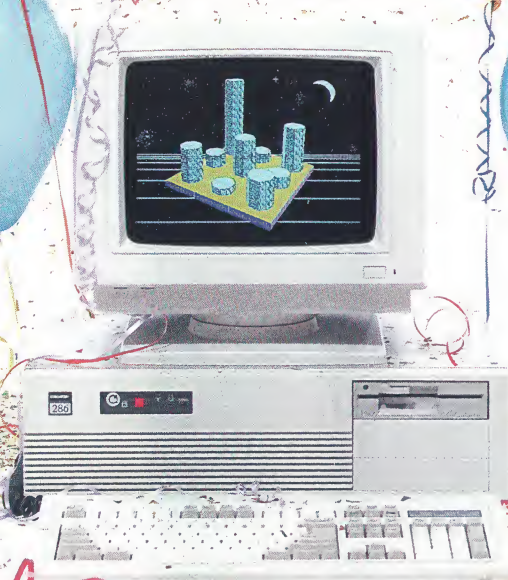
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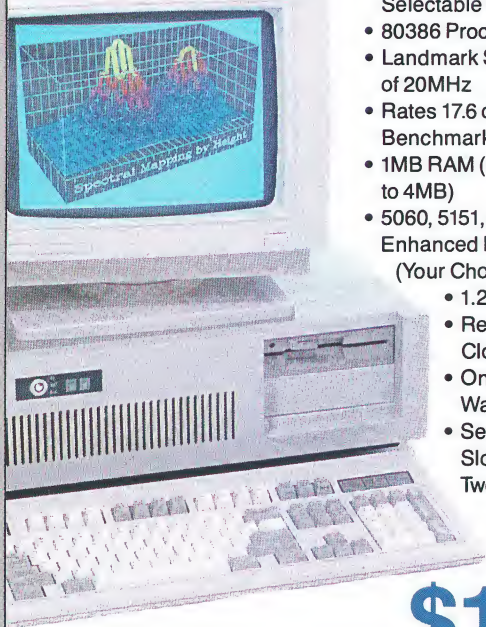
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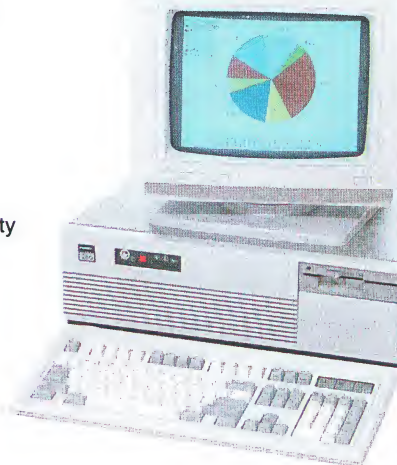


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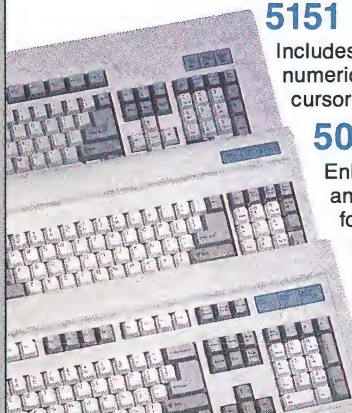
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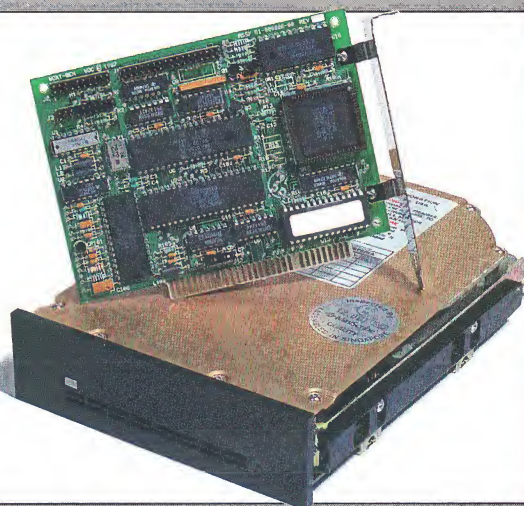
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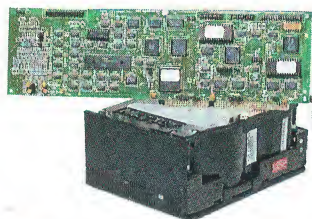
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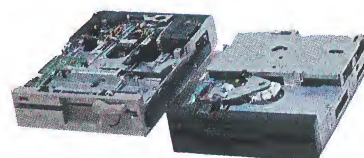
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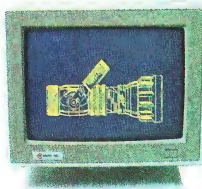
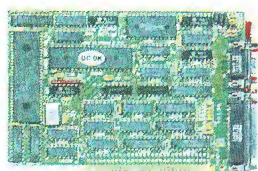
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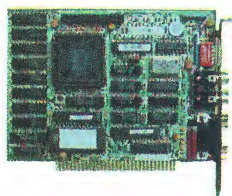
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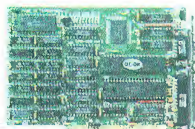
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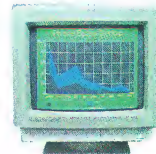
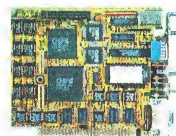
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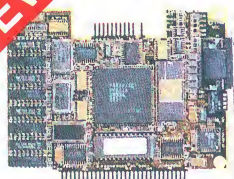
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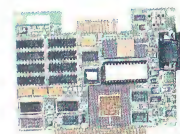


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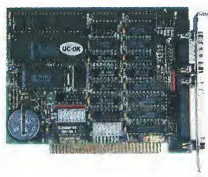
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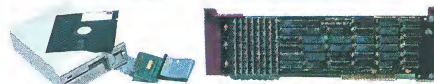
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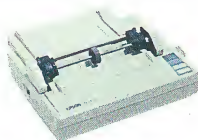
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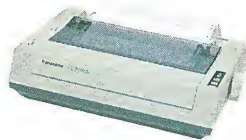


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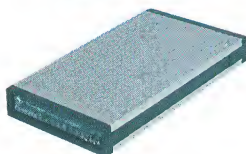
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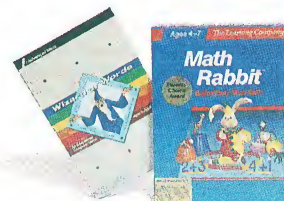
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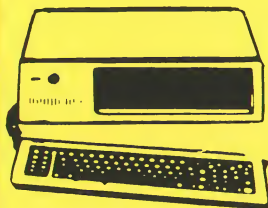
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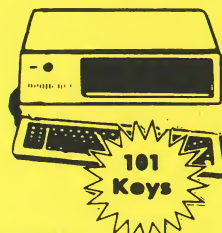
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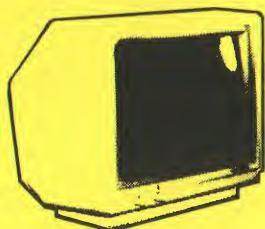
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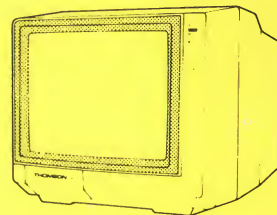
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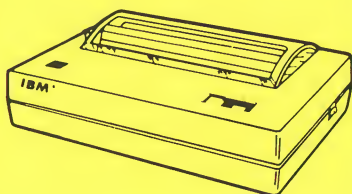
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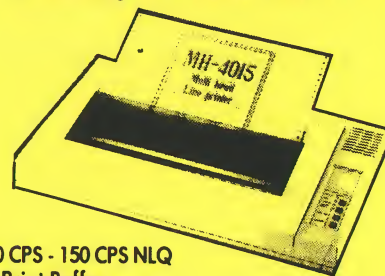
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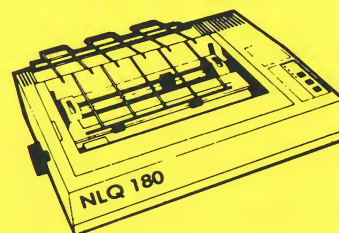
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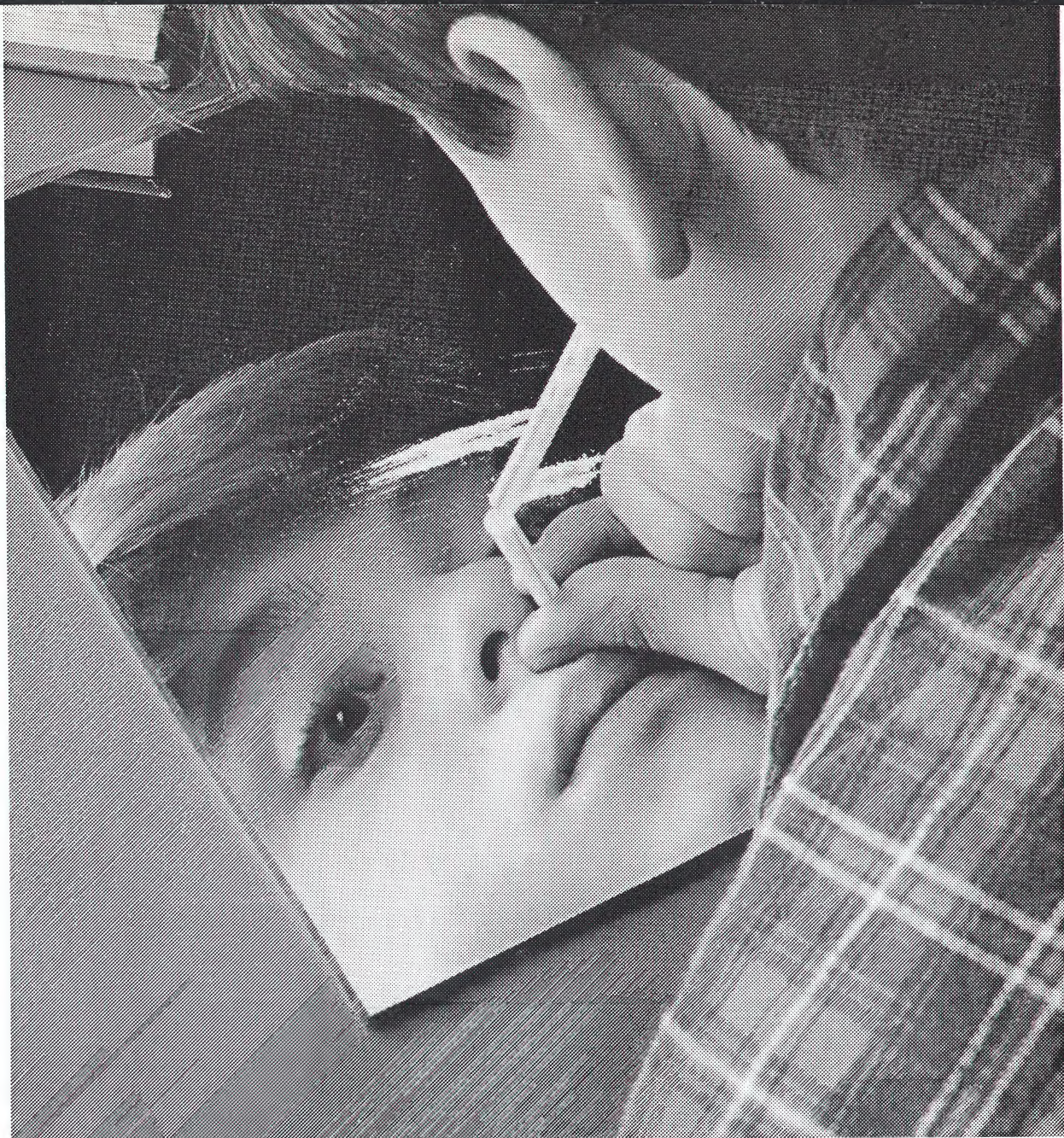
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Star ND-15 As above but 132 column	419
Star NR-10 240cps, 12.6K bfr, NLQ, tr	359
Star NR-15 240cps, 12.6K bfr, 132, NLQ	479
Star NB-15 300cps, 16K bfr, 132, NLQ	699
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Star NB-2415 As above but 132 col	599
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Panasonic KX-P1080i, 80 col/144cps	179
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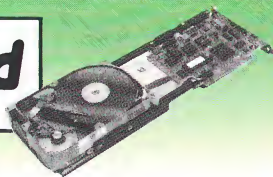
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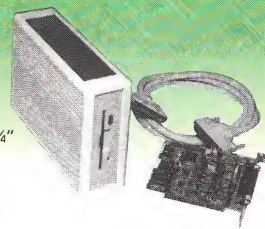
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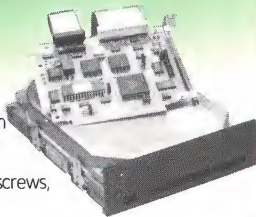
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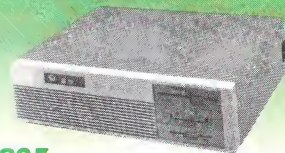


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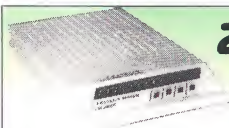
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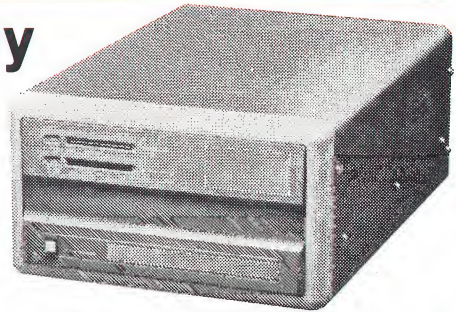


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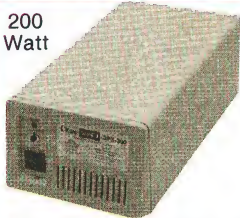
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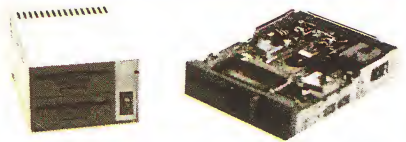


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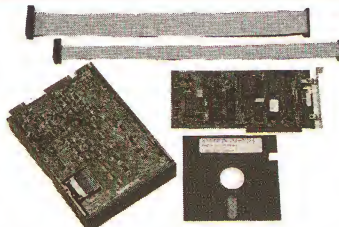
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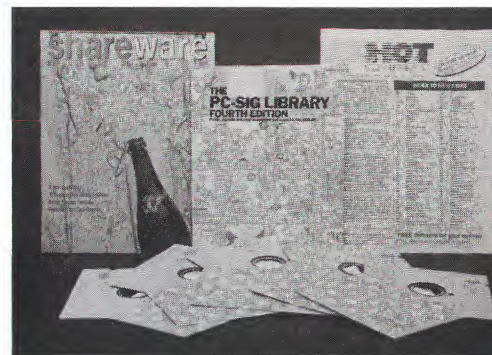
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- Advantage 2/286, mod 80, 1Mb 725.
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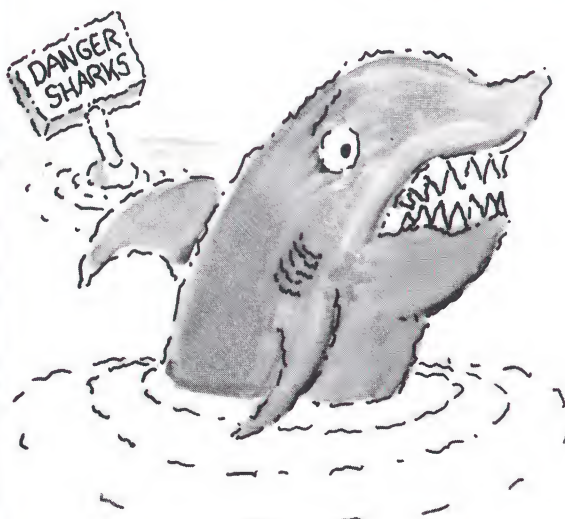
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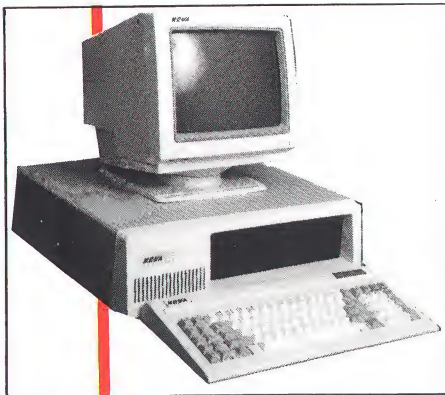
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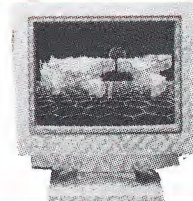


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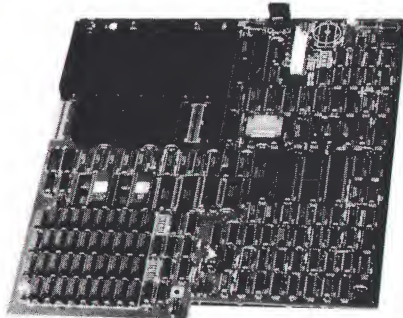
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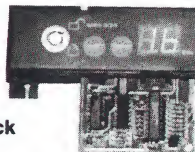
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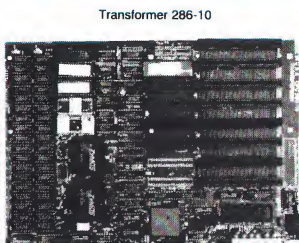
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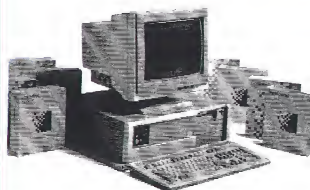


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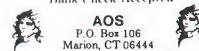
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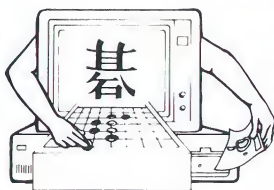
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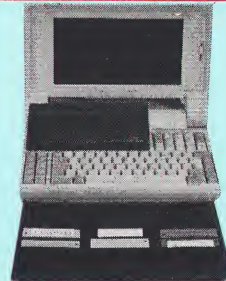
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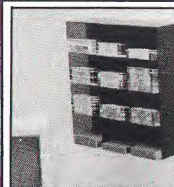
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Memory Resident

That's because the idea of a memory resident spreadsheet makes sense, one that you can pop-up instantly while working in your word processor or any other program. Lucid lets you cut anything on the screen and paste it right into Lucid, or cut anything from a Lucid worksheet and paste into the application below. You

can even run Lucid on top of 1-2-3 if you like, and cut and paste information from one to the other, including formulas.

Lucid 3-D was developed over the past two years with countless, exhaustive hours of planning and programming to produce something spectacular. This is a product that works the way we dreamed a spreadsheet would function. Everyone who has seen it says things like, "Lucid 3-D is how software of the 1990's will look and perform", or even more to the point "This is the way I thought a computer should work". You'll see, Lucid is exciting.

Masterwork

We could go on at great length about all the features and innovations in Lucid, but Lucid is more than a bag of features. What is most important is the pride and craftsmanship that went into its creation. It is a masterwork. The overall feel is tight and polished. In fact Paul, Somerson, editorial director of *PC Computing*, used one word to describe it, "Slick".

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excellent. In 1985 we produced Lightning, the pioneer and award winning Disk speed up software. In 1986 we developed the Breakthru 286 accelerator board that blew everything else out of the water, and later we topped ourselves with the Breakthru 12. Now in 1988 those who have worked with Lucid 3-D tell us "you have done it again. This is software everyone should have."

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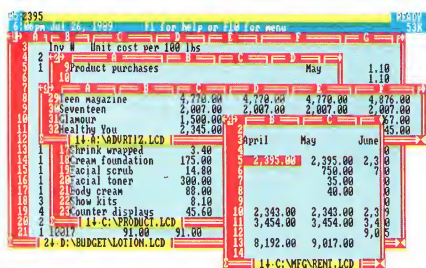


Fig. 5 Of course, Lucid does multiple windows. Notice, you can simultaneously open windows in different directories, different drives, even down as many 3-D levels as you like. No one else can do that.

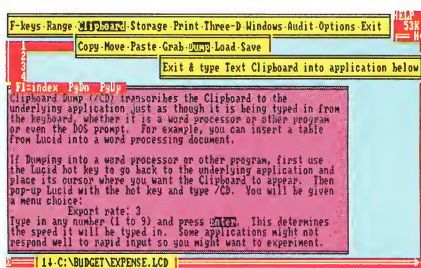


Fig. 6 We need those budget figures in the Word Perfect letter we are writing. Clipboard Dump does it right now.

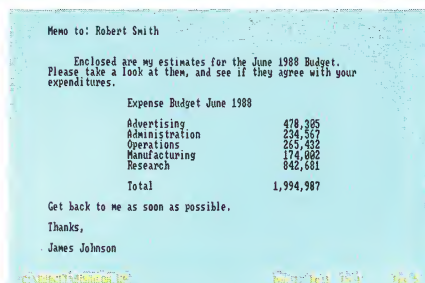


Fig. 7 Here it is right in Word Perfect (or any word processor) just like you typed it. You can go the other way just as easily.

whole new set of choices. What's nice is that they will work from one spreadsheet to another.

Mouseability

Lucid 3-D was designed for both keyboard enthusiasts and mouse lovers alike. You can take your pick. Designed around the mouse from the ground up, the interface is smooth and natural. You select files to load from directory lists. Everything is point and click. What's more, any Lucid 3-D menu selection can be "moused" and the response time is "right now" instead of the sluggish "a little bit behind you" feel of add-on mouse menu systems like those you've seen with 1-2-3.

A window pops up with a library of function names you can page through with the mouse. Select, click and it's in the formula with no typing required. You even have a label window that you can fill (from the keyboard) with favorite labels and names so that you can insert them later with the mouse. There's even a pop-up calculator to insert numbers so you don't have to go to the keyboard very often.

It really permits that feeling of becoming one with your work. Lucid 3-D has windows of user defined range names as well as the macros

named by the user that can be selected just by pointing and clicking. Icons that are easy to grab with the mouse let you resize and move the spreadsheet window with the ease you would expect. Plus you can go anywhere on the sheet by moving the mouse and clicking on the spreadsheet borders. And remember, Lucid is designed so that any of those features are done with or without the mouse easily and quickly.

Audit

When you are staking a big decision on information gained from a spreadsheet you need to be certain that you have made no mistakes. Lucid 3-D offers five audit displays and printouts.

Even if you don't plan to abandon 1-2-3, Lucid makes sense. Files are converted between them with ease so there's not an interoffice compatibility problem. This means you can have the power and fun of Lucid 3-D without having to upset your present systems.

We are excited about Lucid 3-D. But don't take our word for it, take us up on our 60 day offer. Call us on our order line number and we will ship your order the very next day. This \$149 offer will end as soon as our dealer network is fully stocked. But in the mean time we invite you to try Lucid as part of our "spread the news" campaign. Just pick up the phone and call us. We accept all major credit cards or you can order COD.

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Any cell can contain a complete spreadsheet that you can access



Fig. 1 Let's get the detail on those ad costs. Just move the sidebar to that cell and press one key (Grey +).



Fig. 2 Here we are, instantly. Notice the lower left corner showing we are on level 2. You can go down or up.



Fig. 3 We want more detail, so let's go to News papers. Just press the Grey + key.

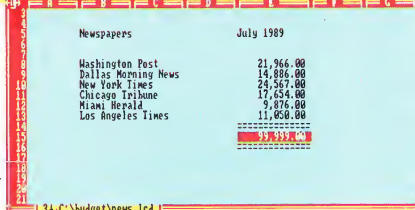


Fig. 4 Now, instantly we are on level 3. Each level is a different spreadsheet. You could now move to the New York Times and see the detail on that figure. There is no limit to the levels you can go. Move right down to transaction level if you like.

What Makes Lucid 3-D So Special

In the screen examples you can see Lucid is really three dimensional. Any cell of the spreadsheet can contain a complete other spreadsheet that you can access with a single keystroke. It is as simple as the pictures show. And you don't have to write formulas to do that.

All you do is go look at the other file, navigating through easy, point and shoot directories. When you come back up (with one key) the link is made automatically for you.

Everything about Lucid works that way. Users say "It is so intuitive that I really don't need a manual." That's because we use something we call a visual command menu. Jim Seymour, the noted PC columnist, talking about Lucid in a recent article said that, "If there ever was an interface idea so good it ought to be stolen and widely used, this is it."

What he was talking about is a new menu approach that follows a simple design concept: it is easier to recognize than it is to remember. As choices are made on a menu that take you to lower levels you always can see exactly where you came from and where you are going. The complete menu path is always visible. You cannot get lost several

levels down. This means you never have to remember a command, you just flow right to it.

Plus, no matter where you are on a menu or what you are doing, just press function key F1, and you will get a help screen specific to that command or action. Or if you want to know about any subject you can pop up an index of over 400 topics and select the one you want.

Notepad Behind Every Cell

Another 3-D feature is that any cell can also contain a multiple page note that you instantly access with a single keystroke. You can write notes, memos or letters that relate to your work, save them as individual files and even print them separately or with your spreadsheet.

Speed

Lucid 3-D is truly revolutionary. It is fast, fast, fast! It is incredibly quick in performing calculations because it doesn't recalculate every cell every time you insert an entry. Instead, it only recalculates the specific cells that are affected by your change. This is called minimal recalc. Lucid also has a remarkable innovation called background recalc in which you are given control of the cursor the moment calculations affecting

your viewing screen are completed. Other calculations you don't see continue on in the background during the next commands. The end result of this powerful combination is you rarely wait for a recalculation with Lucid. You find out what instantaneous is all about.

Lucid Learns

Lucid 3-D also lets you teach it in any combinations of keystrokes so that involved sequences can be done with single keys. Plus more than just remembering keystrokes, Lucid allows you to create Macros with loops, procedures and conditional branching amazingly all done automatically with simple menus. You can create your own menus that show the new features you have taught it. Another great feature is you can make your custom menus work like Lucid where one choice can take you down a level to a

LucidTM

3-D

READY II 56K

ADVER.LCD.D13
10:52am May 26, 1989

F1 for help or F10 for menu

Aggregate expenses for all departments for July 1989:

Advertising	\$321,529.00
Administrative	\$236,382.00
Operations	\$307,645.00
Manufacturing	\$632,591.00
Research and development	\$158,044.00
Total expenses	\$1,656,191.00

11-C:\BUDGET\EXPENSE.LCD

READY II 56K

F1 for help or F10 for menu

Advertising
Magazines
Newspapers
TV & Radio
Skywriting
Total

July 1989

	\$321,529.00
	\$99,999.00
	\$23,876.00
	\$43,260.00
Total	\$528,664.00

24-C:\BUDGET\ADVER.LCD

READY II 56K

F1 for help or F10 for menu

Inc Magazine
Business Week
Money Magazine
Economist
Barons
Forbes

	\$150,954.00
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21-C:\BUDGET\ADVER.LCD

READY II 56K

F1 for help or F10 for menu

Magazine

Mag: Ronald Wilson placed 7.3 4957

Mag deadline: Next day by May 27

Send copy to:

100 Union Ave., Apt: Arthur Jackson

100 Union Ave., Apt: Arthur Jackson

100 Union Ave., Apt: Arthur Jackson

Annual Quantity	200	200	200
1 page x12 rate	\$1,455.00	\$1,455.00	\$1,455.00
Actual cost per issue with special deal	\$1,455.00	\$1,455.00	\$1,455.00

21-C:\BUDGET\ADVER.LCD

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